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A REVISION OF THE GENUS DILLENIA

by

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(Flora Malesiana, Leyden)

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CONTENTS

Page
Introduction 2
Dillenia L. 1753 3
History of the genus 6
Relationships 6
Relationships within the genus 8
Morphological notes 11
  1. Stilt-roots 11
  2. Petiolar wings 11
  3. Vernation 11
  4. Heterophylly 12
  5. Inflorescence 12
  6. Corolla 12
  7. Androecium 12
  8. Gynoecium 14
  9. Fruit and seed 15
Anatomy 15
Geographical distribution 15
Ecology 16
Vernacular names 17
Uses 17
Miscellaneous notes 17
Key to the species 18
Species-descriptions and notes 21
Doubtful species 134
Excluded species 135
Invalidly published names 136
Index to collectors' numbers 137
Index to scientific names 142

INTRODUCTION

The present paper is an extension of my revision of the Malaysian species of the genus *Dillenia* L. (*Wormia* Rottb. included) inserted in the revision of the *Dilleniaceae* in the Flora Malesiana ser. I, vol. 4, part 3, pp. 141—174, published in December 1951. A critical revision of the whole genus has never been published before; the unfortunate result of this has been that the delimitation of *Dillenia* and *Wormia*, usually as distinct genera, has been based on different characters by various authors. The extension of the revision for the Flora Malesiana so as to include the extra-malaysian species enabled me to study a number of species, the knowledge of which certainly confirmed me in my idea that the characters on which *Dillenia* and *Wormia* had been separated before are certainly not the primary characters, to be used in the taxonomic treatment of the genus.

All specimens and literature mentioned in this work have been examined by me, unless indicated otherwise; excepted are the specimens of the U. S. National Herbarium, of which I have only examined those collections, of which no duplicates were available from other herbaria. Particulars, not to be taken from the herbarium specimens themselves, such as habit, height, diameter, colour, etc., have been taken from the collectors' notes and, as far as reliable, from the literature, and are inserted in the descriptions; if there are contradictory data, they are discussed under the Notes.

A great amount of material, kindly lent by various herbaria to the Rijksherbarium, Leyden, made it possible to me to carry out this study. In the citation of the specimens these herbaria are indicated by the abbreviations, proposed by Lanjouw in Chronica Botanica 5, 1939, pp. 142—150; with a single addition (LAE) they are:

A	Arnold Arboretum Herbarium, Harvard University, Jamaica Plain, Mass..
BM	Department of Botany, British Museum (Natural History), London.
BR	Herbier du Jardin Botanique de l'État, Bruxelles.
BRI	Botanical Museum and Herbarium, Brisbane.
BRSL	Botanical Institute, Wroclaw (formerly Breslau).
BZ	Herbarium Bogoriense, Bogor, Java.
C	Universitetets Botaniske Museum, Copenhagen.
CAL	The Royal Botanic Garden and Herbarium, Calcutta.
CGE	Botanical Museum and Herbarium of the University, Cambridge (England).
DD	Forest Research Institute Herbarium, Dehra Dun.
E	Herbarium of the Royal Botanic Garden, Edinburgh.
FI	Erbario del Instituto Botanico dell' Università, Firenze.
G	Institut de Botanique Systématique de l'Université, Genève.
GH	Gray Herbarium, Harvard University, Cambridge, Mass..
GL	Botanical Department Herbarium, Glasgow.
GRO	Botanisch Laboratorium der Rijksuniversiteit, Afdeling Plantensystematiek, Groningen.

IFI	Herbarium of the Imperial Forestry Institute, Oxford.
K	Herbarium, Royal Botanic Gardens, Kew, Surrey.
L	Rijksherbarium, Leiden.
LAE	The Papua and New Guinea Herbarium, Lae.
LINN	Herbarium of the Linnean Society of London, London.
M	Botanische Anstalten, München.
MEL	Botanic Gardens and National Herbarium, Melbourne.
MICH	Herbarium of the University of Michigan, Ann Arbor, Mich..
MO	Herbarium of the Missouri Botanical Garden, St Louis, Mo..
NY	Herbarium of the New York Botanical Garden, New York, N. Y..
OXF	Oxford University Herbarium, Oxford.
P	Laboratoire de Phanérogamie du Muséum National d'Histoire Naturelle, Paris.
S	Naturhistoriska Riksmuseet, Stockholm.
SING	Herbarium of the Botanic Gardens, Singapore.
U	Botanisch Museum en Herbarium, Utrecht.
UC	University of California Herbarium, Berkeley, Calif..
UPS	Botaniska Museet, Uppsala.
US	United States National Herbarium, Washington, D. C..

I wish to express here my indebtedness to the directors and keepers of these herbaria for their valuable help in putting their specimens at my disposal.

A special word of thanks is due to the directors and staffs of those herbaria and libraries which I have personally visited, for the hospitality offered and assistance rendered to me during my stay, viz. at Brussels, Cambridge, Kew, London, Oxford, and Paris.

I am also highly indebted to the "Fonds Vollenhoven", which enabled me to visit Paris and Brussels, and to the British Council, which offered me a grant enabling me to visit the English herbaria mentioned above and made the arrangements for this visit.

My most sincere thanks are due to Prof. Dr H. J. Lam, Director of the Rijksherbarium, Leyden, for his support and for the hospitality shown to me in his institute, and to Prof. Dr C. G. G. J. van Steenis, director of the Foundation Flora Malesiana, Leyden, for the freedom he allowed me to extend my revision of the Malaysian species of *Dillenia* to the present monograph. To both of them and to the members of the staffs of the Rijksherbarium and the Flora Malesiana I feel greatly indebted. The figures are from the able hands of the draughtsman H. J. T. Tammel.

DILLENIA L. 1753

Syalita Rheede, Hort. Mal. 3, 1683, p. 39; Adans., Fam. d. Pl. 2, 1763, p. 364.

Dillenia L., Hort. Cliff., 1737, p. 221; L., Sp. Pl. 1, 1753, p. 535; L., Gen. Pl. ed. 5, 1754, p. 239; Thunb., Trans. Linn. Soc. 1, 1791, p. 198; DC., Syst. 1, 1818, p. 435; DC., Prod. 1, 1824, p. 75; Buch.-Ham., Trans. Linn. Soc. Lond. 15, 1826, p. 99; G. Don, Gen. Hist. Dichl. Pl. 1, 1831, p. 77; Roxb., Fl. Ind. ed. Carey 2, 1832, p. 650; Wight & Arn., Prod. Fl. Pen. Ind. Or. 1, 1834, p. 5; Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 69; Miq., Fl. Ind. Bat. 1, 2, 1859, p. 11; Miq., Fl. Ind. Bat. Suppl. 1, 1860, p. 152, 618, 619; Benth. & Hook.f., Gen. Pl. 1, 1862, p. 13; Drury, Handb. Ind. Fl. 1, 1864, p. 9; Baill., Adansonia 6, 1865—6, p. 281; Miq., Ann. Mus. Bot. Lugd. Bat. 4, 1868, p. 79; Baill., Hist. d. Pl. 1, 1867—9, p. 110; Hook.f. & Thoms., Fl. Br. Ind. 1, 1872, p. 36; Brandis, For. Fl. N.W. & C. India, 1874, p. 1; Kurz, For. Fl. Br. Burma 1, 1877, p. 18; Pierre, Fl. For. Cochinch. 1, 1879, pl. 5—14; Vidal, Sinops. Fam. & Gen. Pl. Len. Filip., 1883, p. 24; Martelli in Becc., Malesia 3, 1886, p. 154; King, J. As. Soc. Beng. 58, II, 1889, p. 366; Boerl., Handl. Fl. Ned. Ind. 1, 1890, p. 8; Watt, Dict. Econ. Prod. India 3, 1890, p. 112; Trimen, Handb. Fl. Ceyl. 1, 1893, p. 12; Koord. & Val., Bijdr. 1 Booms. Java, 1894, p. 160; Gilg in Engl. & Prantl, Nat. Pfl. Fam. 3, 6, 1895, p. 123; Pritzel, Bot. Jahrb. 24, 1897, p. 354; Brandis, Ind. Forester

26, 1900, p. 429; Gamble, Man. Ind. Timb. 2nd ed., 1902, p. 4; Duthie, Fl. Upp. Gang. Pl. 1, 1903, p. 20; Brandis, Ind. Trees, 1906, p. 3; Fin. & Gagnep., Bull. Soc. Bot. Fr. Mém. 4, 1906, p. 5; Moll & Janssonius, Mikrogr. Holz. Java Baumarten 1, 1906, p. 71; Fin. & Gagnep., Fl. Gén. Ind.-Ch. 1, 1907, p. 16; Ridl., J. Str. Br. R. A. S. 54, 1910, p. 7; Back., Schoolfl. Java, 1911, p. 10; Svedelius, Svensk Bot. Tidskr. 5, 1911, p. 152; Koord., Exk. Fl. Java 2, 1912, p. 601; Ridl., Saraw. Mus. J. 1, 1913, p. 70; Gamble, Fl. Pres. Madras 1, 1915, p. 7; Haines, Bot. Bihar & Orissa 2, 1921, p. 6; Merr., Bibl. En. Born. Pl., 1921, p. 382; Diels, Bot. Jahrb. 57, 1922, p. 436; Ridl., Fl. Mal. Pen. 1, 1922, p. 10; Merr., En. Philip. Fl. Pl. 3, 1923, p. 59; Parkinson, For. Fl. Andam. Isls, 1923, p. 71; Craib, Fl. Siam. En. 1, 1925, p. 21; Gilg & Werderm. in Engl. & Prantl, Nat. Pfl. Fam. 2nd ed., 21, 1925, p. 35; Foxworthy, Mal. For. Rec. 3, 1927, p. 147; Pears. & Brown, Comm. Timb. India 1, 1932, p. 1; Kanjilal, Kanjilal, & Das, Fl. Assam 1, 1934, p. 10; Burk., Dict. Econ. Prod. Mal. Pen., 1935, p. 808; Parkinson, Ind. Forester 61, 1935, p. 450; Gagnep., Suppl. Fl. Gén. Ind.-Ch. 1, 1938, p. 20; Corn., Gard. Bull. S. S. 10, 1939, p. 3; Corn., Wayside Trees Malaya, 1940, p. 203; Back., Bekn. Fl. Java (em. ed.) 4, 1942, fam. 80, p. 4; Masamune, En. Phan. Born., 1942, p. 462; Masamune, Fl. Kainantensis, 1943, p. 205; Heyne, Nutt. Pl. Indon., 1950, p. 1071; Hoogl., Fl. Mal. I, 4, 1951, p. 154.

Wormia Rottb., Nye Samml. Vidensk. Selsk. Skrift. 2, 1783, p. 531, non *Vormia* Adans., Fam. d. Pl. 2, 1763, p. 248, nec *Wormia* Vahl, Skrift. Nat. Selsk. Kjoeb. 6, 1810, p. 104; DC., Syst. 1, 1818, p. 433; DC., Prod. 1, 1824, p. 75; G. Don, Gen. Hist. Dichl. Pl. 1, 1831, p. 76; Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 66; Miq., Fl. Ind. Bat. 1, 2, 1859, p. 10; Miq., Fl. Ind. Bat. Suppl. 1, 1860, p. 152, 618, 619; Benth. & Hook.f., Gen. Pl. 1, 1862, p. 13; Baill., Adansonia 6, 1865—6, p. 281; Miq., Ann. Mus. Bot. Lugd. Bat. 4, 1868, p. 76; Baill., Hist. d. Pl. 1, 1867—9, p. 112; Hook.f. & Thoms., Fl. Br. Ind. 1, 1872, p. 35; Vidal, Sinops. Fam. & Gen. Pl. Len. Filip., 1883, p. 24; King, J. As. Soc. Beng. 58, II, 1889, p. 364; Boerl., Handl. Fl. Ned. Ind. 1, 1890, p. 7; Koord. & Val., Bijdr. 1 Booms. Java, 1894, p. 167; Moll & Janssonius, Mikrogr. Holz. Java Baumarten 1, 1906, p. 69; Ridl., J. Str. Br. R. A. S. 54, 1910, p. 1; Back., Schoolfl. Java, 1911, p. 9; Svedelius, Svensk Bot. Tidskr. 5, 1911, p. 152; Koord., Exk. Fl. Java 2, 1912, p. 600; Ridl., Fl. Mal. Pen. 1, 1922, p. 7; Gilg & Werderm. in Engl. & Prantl, Nat. Pfl. Fam. 2nd ed., 21, 1925, p. 33; Burk., Dict. Econ. Prod. Mal. Pen., 1935, p. 2265; Corn., Gard. Bull. S. S. 10, 1939, p. 3; Corn., Wayside Trees Malaya, 1940, p. 205; A. C. Smith, J. Arn. Arb. 22, 1941, p. 498; Back., Bekn. Fl. Java (em. ed.) 4, 1942, fam. 80, p. 3.

Lenidia Du Petit-Thouars, Gen. Nov. Madag., 1806, p. 17; Poir., Encycl. Suppl. 3, 1813, p. 330; Poir., Dict. Sc. Nat. 25, 1822, p. 447.

Colbertia Salisb., Parad. Lond. 2, 1, 1807, sub t. 73, based on *Dillenia pentagyna* Roxb., not published here with specific epithet; DC., Syst. 1, 1818, p. 435; DC., Prod. 1, 1824, p. 75; G. Don, Gen. Hist. Dichl. Pl. 1, 1831, p. 77.

Capellia Bl., Bijdr. 1, 1825, p. 5; G. Don, Gen. Hist. Dichl. Pl. 1, 1831, p. 77; A. Gray, Bot. U. S. Expl. Exped. 1, 1854, p. 15.

Reifferscheidia Presl, Rel. Haenk. 2, 1836, p. 71; Benth. & Hook.f., Gen. Pl. 1, 1862, p. 13; Baill., Hist. d. Pl. 1, 1867—9, p. 114.

Capellenia Bl. ex Hassk., Cat. Hort. Bog. Alt., 1844, p. 178 (intended as correction for *Capellia*).

Neowormia Hutchins. & Summerh., Kew Bull. 1928, p. 388.

Type species: *Dillenia*: *D. indica* L. 1753, l. c.. — *Syalita*: *Syalita* Rheede 1683, l. c., = *Dillenia indica* L.. — *Wormia*: *W. triquetra* Rottb. 1783, l. c., = *Dillenia triquetra* (Rottb.) Gilg. — *Lenidia*: *L. madagascariensis* Poir. 1813, l. c., = *Dillenia triquetra* (Rottb.) Gilg. — *Colbertia*: *Dillenia pentagyna* Roxb. 1795. — *Capellia*: *C. multiflora* Bl. 1825, l. c., = *Dillenia excelsa* (Jack) Gilg. — *Reifferscheidia*: *R. speciosa* Presl 1836, l. c., = *Dillenia reifferscheidia* Villar. — *Neowormia*: *N. ferruginea* (Baill.) Hutchins. & Summerh. 1928, l. c., = *Dillenia ferruginea* (Baill.) Gilg.

Usually trees, some species only shrubs; evergreen or, less often, deciduous. Stilt-roots usually absent, in some species occasionally developed, in only 3 species constant (*D. eximia, D. reticulata,* and *D. borneensis*); buttresses often more or less distinct. Bark usually about reddish brown, peeling off in thin, often papery flakes. Branches in most species sympodial, branching from axil of uppermost leaf below inflorescence or solitary flower, in some species monopodial with axillary or twig-borne flowers or inflorescences, in 2 species (*D. aurea* and *D. obovata*) branching from axil of bracts some distance below solitary flower. Leaf-scars either completely amplexicaul or clasping up to ca ¾ of branches. *Leaves* spirally arranged, simple, pinnately nerved with 4 to ca 90 nerves on either side, entire to distinctly dentate or undulate at margin; main venation about transverse between nerves, minor venation reticulate; sometimes 1(—3) secondary nerves directed downward from nerves near margin, ending in apex of smaller teeth than primary nerves; midrib, nerves, and veins usually prominent on both sides, most so beneath. Petiole channelled above, either with narrow to broad, often partly or wholly caducous, completely amplexicaul wings, in young leaf enclosing terminal bud, or without or with only narrow, not completely amplexicaul, persistent wings. Leaves of saplings and young trees generally larger than those of older branches, in some species distinctly different (cf. note on p. 12 and under *D. ferruginea*). *Flowers* in racemose inflorescences or solitary and terminal on leaf-bearing branches, solitary in axil of leaves, solitary or in few-(up to 7)-flowered fascicled inflorescences lateral on older, defoliate branches, or solitary and terminal on leafless branches with many bracts; distinctly pedicellate. Bracteoles usually inconspicuous or absent, sometimes large. Sepals (4—)5(—6), in some species 8—18, free, imbricate, permanent in fruit. Petals 5, only in one species (*D. fischeri*) sometimes 4 or 6, caducous, completely free, in some species corolla falling as a whole without spreading, in some species absent. Androecium consisting of ∞ stamens and, sometimes, a distinct group of ∞ staminodes, all free or staminodes slightly to distinctly coherent; distinct group of staminodes on outer or, in one species (*D. fagifolia*) only, on inner side of androecium; when no distinct staminodial group present often some of outermost stamens sterile, with transitions to inner fertile ones; stamens either all of about same length or in 2 more or less sharply separated groups of different length; anther basifixed; thecae linear or, rarely, oblong, opening either with pore at or near apex or with longitudinal slit. Carpels 4—20, arranged in one whorl around a broadly to narrowly conical protruding part of the receptacle, for the greater part free, coherent with each other along conical part of the receptacle, exceeding this cone so as to enclose a small cavity above it, which at least in a number of species has an open connection with the interior cavity of the carpels by means of a longitudinal slit between the upper parts of the margins of the carpel. Ovules 4 to ca 80 pro carpel, arranged in 2 marginal, adaxial placentae, each with a single or, in the case of many ovules, in the lower part with a double row; anatropous, apotropous, with 2 integuments. *Pseudocarps* consisting of gynoecium and calyx, when young gynoecium usually completely enclosed by enlarged sepals, rarely the apical part not fully enclosed; adult pseudocarps either dehiscent, the sepals and carpels spreading star-like, the carpels opening along the adaxial suture, often more or less coherent with the neighbouring one in the basal part of the suture, or indehiscent, the gynoecium enclosed by the usually strongly enlarged sepals; usually pro carpel only 1 or few seeds developed. Seeds arillate with fleshy to membranous aril, completely enclosing the seed to only a minute cup at the base, or exarillate but with rudimentary aril in young state; seed-wall 3-layered, outer layer dark brown to black, containing tannine; endosperm abundant, containing proteine and oil; embryo minute.

History of the genus.

From a nomenclatural point of view the genus *Dillenia* was founded by Linnaeus (1753 & 1754) with one species, *D. indica,* which therefore is the nomenclatural type. The oldest pre-Linnean publication is that of Rheede (1683) who described "*Syalita*" from Malabar, on whose figure and description *D. indica* L. is practically wholly based. Linnaeus dedicated the genus to the botanist Dillenius as it excels among other genera by its flower and fruit like Dillenius among botanists (Critica Botanica, 1737, p. 80: "Dillenia flore et fructu omnium speciosissimo, ut Author inter Botanicos").

The genus *Wormia* was founded by Rottboell (1783) on a specimen from Ceylon; he did not compare his new genus with *Dillenia.* Thunberg (1791) described a number of new species of *Dillenia,* some of which are based on pre-Linnean publications, some on actual specimens; among the latter is *Dillenia dentata,* based on a specimen from Ceylon, which appears to be identic with *Wormia triquetra* Rottb.. Thunberg does not seem to have been aware of this. Vahl (1810) was the first to reduce *Wormia* to *Dillenia,* but he was not followed by later authors until Martelli (1886). The latter, in a revision of the *Dilleniaceae* from Beccari's collections from Malaysia, listed all species described under *Dillenia* and *Wormia* with the indication that they all should be brought under *Dillenia*; formally he failed, however, to make most of the new combinations, which have been ascribed to him by Durand & Jackson in the first Supplement of the Index Kewensis (1902). Gilg, in the first edition of the "Natürliche Pflanzenfamilien", also reduced *Wormia* to *Dillenia,* publishing some new combinations (1895). In the second edition, however, Gilg & Werdermann (1925) reestablished the genus *Wormia* on account of the presence of an aril.

Later synonyms, which have only occasionally been used, are: *Lenidia* Du Petit-Thouars (1806), used in a sense completely identic with that in which *Wormia* was understood; *Colbertia* Salisb. (1807), representing the deciduous, ramiflorous species; *Capellia* Bl. (1825), differing from *Wormia* by the structure of the androecium; *Reifferscheidia* Presl (1836), based on a species with a large number of sepals; and *Neowormia* Hutchins. & Summerh. (1928), considered by the authors to represent a form, intermediate between *Dillenia* and *Wormia,* differing in the structure of the androecium, the connate carpels, and the racemose inflorescences; of these differences only the first one holds, but it is to my idea insufficient for generic distinction.

Relationships.

The systematic position of the *Dilleniaceae* is generally accepted nowadays somewhere between the *Polycarpicae* and the *Parietales s. l.*. Most recent authors place it in the *Guttiferales* or *Theales* as first family, with as most important differential character within these orders the complete or nearly complete apocarpy. Corner (J. Arn. Arb. 27, 1946, p. 423) has indicated that the character of the centrifugal stamens may be of systematic value; as to this character relationship to the *Parietales* (centrifugal stamens) is indicated in preference to that to the *Polycarpicae* (centripetal stamens except *Paeonia*, the systematic position of which, however, is disputable). For the Dilleniaceous genera *Tetracera* L. and *Hibbertia* Andr. the centrifugal development of the stamens is clearly indicated, for *Dillenia* Corner unfortunately studied a species where in the full-grown flower the stamens gradually diminish in size in centrifugal direction; the investigations should be repeated in a species where in the open flower all stamens are of about the same size.

Within the *Dilleniaceae* Gilg & Werdermann (1925) distinguish 4 tribes; to my mind a better subdivision would be obtained by the distinction of 2 subfamilies, the first, to be called *Tetraceroideae*, including their tribe *Tetracereae*, the second, to be called *Dillenioideae*, including their tribes *Hibbertieae*, *Acrotremeae*, and *Dillenieae*. Within the *Dillenioideae* the genera show reticulate relationships and may be arranged in different ways according to different principles.

The most primitive structure of the flower within the *Dillenioideae* is found in some species of *Hibbertia* with completely actinomorphic flowers with ∞ uniform stamens and ∞ carpels, the latter completely free on a flat receptacle. From this type the other types in *Hibbertia* and the other genera can be derived according to the following principles: reduction within the androecium, resulting in the formation of staminodes around, between, or inside the stamens (*Hibbertia*, *Dillenia*); one-sided reduction within the androecium (*Hibbertia*, *Schumacheria*, *Didesmandra*); reduction of the gynoecium, consisting in reduction of the number of carpels to a minimum of 1 (*Hibbertia*); coalescence of the filaments to 2 (*Schumacheria*) or 1 (*Didesmandra*) staminal groups, in the latter case the stamens are partly sterile; beginning syncarpy along the central axis (*Acrotrema*, *Dillenia*); and elevation of the central part of the receptacle to a cone between the carpels (*Dillenia*).

A remarkable character in the vegetative parts, of which the systematic value is uncertain, is found in the amplexicaul petiolar wings, which occur in *Acrotrema*, *Schumacheria*, *Didesmandra*, and a part of the species of *Dillenia*. The fact that a number of species of *Dillenia* do not show this character makes its value rather doubtful.

As to the floral structure *Dillenia* shows the closest relationship to *Hibbertia* and *Acrotrema*, the distinctive character being the conical elevation of the central part of the receptacle in *Dillenia*. The inflorescences in *Dillenia* and *Acrotrema* are racemose, in *Hibbertia* cymose, but in all these genera single flowers are found in a number of species. As to the structure of the gynoecium the genus *Dillenia* may be considered the most advanced in the family, as to the structure of the androecium a number of species are advanced regarding differentiation (partly staminodial; innermost stamens longer than outer ones, forming a distinct group), but the whole genus is primitive in the actinomorphic androecium (this being zygomorphic in a number of species of *Hibbertia*, in *Schumacheria*, and in *Didesmandra*).

Relationships within the genus.

For the distinction of the subgeneric groups several characters have been used by different authors. It is impossible, however, to distinguish few larger groups which are characterised by more than one character; all characters which have been used for a subgeneric subdivision appear to be independent from each other. I have, therefore, refrained from the distinction of taxa below the generic rank which, if based on more than one character, would include each only few species. Nevertheless, the sequence of the species as adopted here reflects, as far as possible, my ideas about the relationships within the genus.

The main characters, on which I have arranged the species, are the structure of the leaf-base, the insertion of the inflorescence, and the structure of the androecium; the structure of the fruit and the presence or absence of an aril are, in my opinion, of minor importance and have not been used. As the primary character for the sequence I have chosen the amplexicaul versus non-amplexicaul base of the petiole; this character is constant in some other genera of the *Dilleniaceae* and its geographical distribution seems to indicate a closer relationship within the two groups, distinguished on it, than within the groups, distinguished on the structure of the androecium. The species with completely amplexicaul petiolar wings are found from Madagascar and Ceylon to Queensland and the Fiji Islands, but are missing in continental Asia except the Malay Peninsula, in the greatest part of Sumatra, in Java (except a species in W. Java which, however, is most probably introduced), and in the Lesser Sunda Islands. The species where the petiole has no amplexicaul wings are found in continental S E. Asia, and in Malaysia eastward to a line which mainly agrees with Wallace's line as modified by Merrill and Dickerson regarding the Philippines and by Zollinger regarding the Lesser Sunda Islands (cf. Flora Malesiana I, 1, 1951, p. LXXIII), with a few minor deviations in the Philippines and S. Celebes (fig. 1).

The insertion of the inflorescence has been used as a secondary character only in the group of species with non-amplexicaul base of the petiole; all species with amplexicaul petiolar wings have terminal inflorescences, only in *D. fischeri* together with axillary inflorescences. As tertiary character the structure of the androecium has been used; this will be discussed more extensively later on (p. 12).

The following enumeration of the species in the sequence adopted in this revision indicates the characters on which the sequence has been based in its major lines. Within the smaller groups reduction of the inflorescence from many-flowered to solitary flowers has been accepted as a general principle for the sequence, but it is impossible to use this character consistently.

A. Species with completely amplexicaul petiolar wings.

a. Stamens all alike; no distinct group of staminodes present.

1. *D. beccariana* Martelli; 2. *D. albiflos* (Ridl.) Hoogl.; 3. *D. celebica* Hoogl.; 4. *D. serrata* Thunb.; 5. *D. fischeri* Merr.; 6. *D. pteropoda* (Miq.) Hoogl.; 7. *D. triquetra* (Rottb.) Gilg; 8. *D. ovalifolia* Hoogl.; 9. *D. quercifolia* (Lane-Poole) Hoogl..

(species 10—17 inclusive all have, as far as known, the corolla falling off as a whole without spreading; cf. p. 12)

10. *D. schlechteri* Diels; 11. *D. montana* Diels; 12. *D. ingens* Burtt (corolla unknown);

13. *D. papuana* Martelli; 14. *D. crenata* (A. C. Smith) Hoogl.; 15. *D. salomonensis* (White) Hoogl.; 16. *D. insignis* (A. C. Smith) Hoogl..

b. Innermost stamens not reflexed outward over the outer ones; on the outer side of the androecium there is a distinct group of staminodes.

17. *D. biflora* (A. Gray) Martelli ex Dur. & Jacks.; 18. *D. ferruginea* (Baill.) Gilg.

c. Innermost stamens reflexed outward over the outer ones; no distinct group of staminodes present.

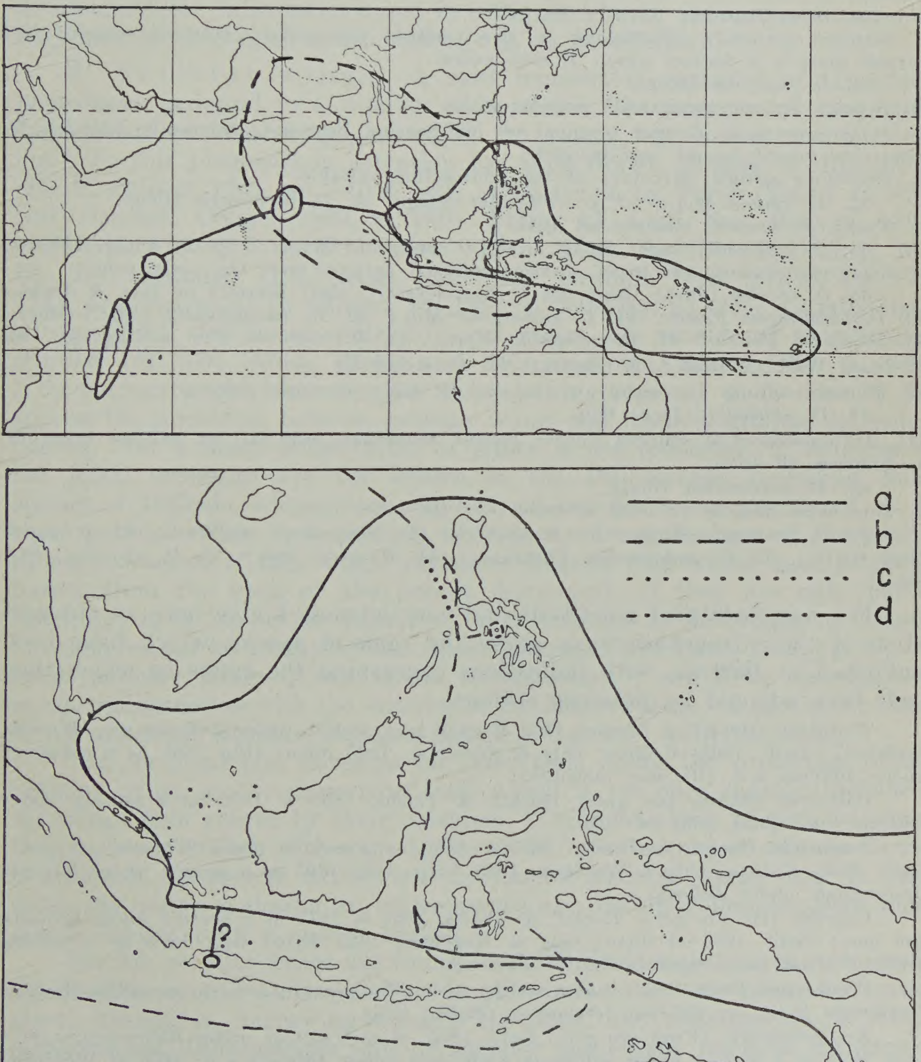


Fig. 1 — Area of the species with completely amplexicaul petiolar wings (a) and of those with non-amplexicaul petiole (b); c. northern continuation of Wallace's line as modified by Merrill & Dickerson; d. southern continuation of Wallace's line as modified by Zollinger. The occurrence of a species with completely amplexicaul petiolar wings in W. Java is probably due to introduction.

19. *D. alata* (DC.) Martelli; 20. *D. auriculata* Martelli; 21. *D. castaneifolia* (Miq.) Martelli ex Dur. & Jacks.; 22. *D. bolsteri* Merr.; 23. *D. diantha* Hoogl.; 24. *D. talaudensis* Hoogl.; 25. *D. ochreata* (Miq.) Teysm. & Binn. ex Martelli; 26. *D. megalantha* Merr.; 27. *D. philippinensis* Rolfe.

(28 & 29 have a larger number of sepals)

28. *D. marsupialis* Hoogl.; 29. *D. reifferscheidia* Villar.

d. Innermost stamens reflexed outward over the outer ones; on the outer side of the androecium there is a distinct group of staminodes.

30. *D. suffruticosa* (Griff.) Martelli.

e. Stamens gradually diminishing in size towards the centre; between stamens and carpels there is a distinct group of staminodes.

31. *D. fagifolia* Hoogl..

B. Species without amplexicaul petiolar wings.

I. Inflorescences or flowers terminal on leaf-bearing branches, eventually later on by sympodial growth lateral, leaf-opposed.

a. Deciduous species; structure of the androecium variable.

32. *D. eximia* Miq.; 33. *D. reticulata* King; 34. *D. borneensis* Hoogl..

b. Evergreen species; stamens all alike.

35. *D. mansoni* (Gage) Hoogl.; 36. *D. bracteata* Wight; 37. *D. hookeri* Pierre.

c. Evergreen species; innermost stamens reflexed outward over the outer ones.

38. *D. excelsa* (Jack) Gilg; 39. *D. luzoniensis* (Vidal) Martelli ex Dur. & Jacks.; 40. *D. blanchardii* Pierre; 41. *D. sumatrana* Miq.; 42. *D. sibuyanensis* (Elm.) Merr.; 43. *D. retusa* Thunb.; 44. *D. monantha* Merr.; 45. *D. turbinata* Fin. & Gagnep.; 46. *D. ovata* Wall. ex Hook.f. & Thoms.; 47. *D. indica* L..

II. Flowers solitary (or serial) in the axil of fully developed leaves.

48. *D. pulchella* (Jack) Gilg.

III. Inflorescences or solitary flowers lateral, sometimes terminal, on leaf-less branches.

a. Stamens all alike.

49. *D. parkinsonii* Hoogl..

b. Innermost stamens reflexed outward over the outer ones.

50. *D. pentagyna* Roxb.; 51. *D. scabrella* (D. Don) Roxb. ex Wall.; 52. *D. parviflora* Griff.; 53. *D. andamanica* Parkinson; 54. *D. aurea* Sm.; 55. *D. obovata* (Bl.) Hoogl..

For nomenclatural exactitude and completeness I give here an enumeration of the infrageneric taxa above the rank of species which have been published in *Dillenia*, with indications concerning the ranks in which they have been adopted by previous authors.

Eudillenia Hook.f. & Thoms. 1855 & 1872 as a section under *Dillenia* s.s. (*Wormia* excluded); Baill. 1865—6 ditto; Gilg & Werderm. 1925 ditto; Gilg 1895 as a subgenus under *Dillenia* s. l. (*Wormia* included).

Colbertia (Salisb. pro gen.) Hook.f. & Thoms. 1855 & 1872 as a section under *Dillenia* s. s.; Baill. 1865—6 ditto.

Euwormia Hook.f. & Thoms. 1855 & 1872 as a section under *Wormia* pro gen.; Baill. 1865—6 ditto; Gilg & Werderm. 1925 ditto; Gilg 1895 as a section under *Wormia* pro subgen. under *Dillenia* s. l..

Capellia (Bl. pro gen.) Hook.f. & Thoms. 1855 & 1872 as a section under *Wormia* pro gen.; Baill. 1865—6 ditto; Gilg & Werderm. 1925 ditto; Gilg 1895 as a section under *Wormia* pro subgen. under *Dillenia* s. l.:

Wormiopsis Baill. 1865—6 as a section under *Wormia* pro gen.; type species *Wormia ferruginea* Baill., = *Dillenia ferruginea* (Baill.) Gilg.

Reifferscheidia (Presl pro gen.) Baill. 1865—6 as a section under *Wormia* pro gen.; Gilg 1895 as a section under subgenus *Eudillenia* under *Dillenia* s. l.; Gilg & Werderm. 1925 as a section under *Dillenia* s. s..

Wormia (Rottb. pro gen.) Gilg 1895 as a subgenus under *Dillenia* s. l..

Protodillenia Gilg 1895 as a section under subgenus *Eudillenia* under *Dillenia* s. l..

Fasciculatae Gilg 1895 as a subsection under section *Protodillenia,* subgenus *Eudillenia* under *Dillenia* s. l.; type species *Dillenia pentagyna* Roxb..

Grandiflorae Gilg 1895 as a subsection under section *Protodillenia,* subgenus

Eudillenia under *Dillenia* s. l.; type species *Dillenia indica* L..
Alatae Ridl. 1922 without indication of rank under *Wormia* pro gen..
Exalatae Ridl. 1922 ditto.

Morphological notes.

1. Stilt-roots occur constantly only in 3 species (*D. eximia*, *D. reticulata*, and *D. borneensis*), which are closely related also as regards structure of the inflorescence and in being deciduous. In some other species they may be developed occasionally (e. g. in *D. albiflos*).

2. Petiolar wings. A most remarkable character of taxonomic importance is found in a number of species in the presence of completely amplexicaul petiolar wings, which in the young leaf enclose the terminal bud. To this phenomenon attention has been drawn already by Rumphius (Herb. Amb. 2, 1741, pp. 140 & 142) and later on by Treub (Hand. 1e Ned. Nat. Geneesk. Congr., 1887, p. 130), Potter (J. Linn. Soc. Bot. 28, 1891, p. 346, pl. 47, fig. 5 A—D), Groom (Trans. Linn. Soc. Bot. 3, 1893, p. 263, fig. 32), Schimper (Pfl. Geogr. auf Oekol. Grundl., 1898, p. 355, fig. 172, 174), and Fairchild (J. Hered. 18, 1927, p. 328, fig. 23, 24). Usually these wings, which may be of quite different shape, are considered to represent stipules (cf. also Glück, Blatt- und Blütenmorphol. Stud., 1919, p. 205). I do not agree with this view for the following reasons: 1. In some of the species the transition between petiolar wings and blade is gradual to such a degree, that a sharp delimitation of either is not indicated. 2. Stipules of the usual structure are not known in the *Dilleniaceae*, including those species of *Dillenia*, where these amplexicaul petiolar wings are absent. 3. If these petiolar wings are caducous, they loosen from the base of the petiole upward, whereas if they would represent stipules they would most probably loosen from the apex of the petiole downward; if they are only partly caducous, it is the upper part that is persistent. 4. According to Ozenda (Recherches sur les Dicotylédones Apocarpiques; Thèse Paris, 1949, pp. 96—7) these petiolar wings ("expansions stipuliformes") are little vascularised, in contradistinction with the stipules of the *Magnoliaceae*; in particular there is no unpaired stipular vascular bundle on a level with the node.

The terminal bud develops for some time under the protection of the petiolar wings of the uppermost leaf, which is yet only slightly unfolded; the wings then cohere by their margins. Within one pair of petiolar wings thus a young branch with some leaves or an inflorescence or solitary flower is enclosed. In species with relatively narrow petiolar wings (e. g. *D. celebica*) the wings enclosing an inflorescence are distinctly broader than those which enclose only a sterile branch.

Similar petiolar wings are found in the Dilleniaceous genera *Acrotrema*, *Schumacheria*, and *Didesmandra*. In *Acrotrema* they are generally broad, about triangular, narrowing towards the apex, and membranous, in *Schumacheria* and *Didesmandra* they are narrow and closely resemble the narrow petiolar wings such as are found e. g. in the species of *Dillenia* where these are not amplexicaul.

3. Vernation. The young leaves are folded upward along the nerves and downward along a line exactly in the middle between two nerves. This line is still visible in fully developed leaves in some species,

most distinctly in *D. ovalifolia*. Near the midrib it is curved downward and it ends at the midrib in the axil of the lower one of the two nerves.

4. Heterophylly. In some species a distinct heterophylly is developed between the leaves of the older branches, which also bear the inflorescences, and those of the saplings and young trees. The most striking example is *D. ferruginea,* where the differences are found in the shape and size of the leaf and in the indument. The leaves of saplings and young trees are glabrous above, very sparsely and shortly strigose beneath, those of the older branches are densely and shortly tomentose above, densely hirsute beneath, with an indument of a rusty brown colour. In the leaves of saplings and young trees the transition between the base of the blade and the petiolar wings is gradual, a sharp delimitation of either is not indicated; in the leaves of the older branches the petiolar wings gradually narrow towards the base of the blade and here exists a sharp delimitation of either, indicated also by differences in nervation (cf. fig. 5, p. 48).

In *D. pentagyna* a similar heterophylly exists, but there is not a similar difference in the indument. It should be noted that *D. ferruginea* belongs to the species with completely amplexicaul petiolar wings, whereas the petiolar wings in *D. pentagyna* are non-amplexicaul. The petiolar wings of the leaves of saplings and young trees of *D. pentagyna* give the impression of being completely amplexicaul, but the scars they leave on the branches are non-amplexicaul and the impression is only caused by the more or less auriculiform base of the wings.

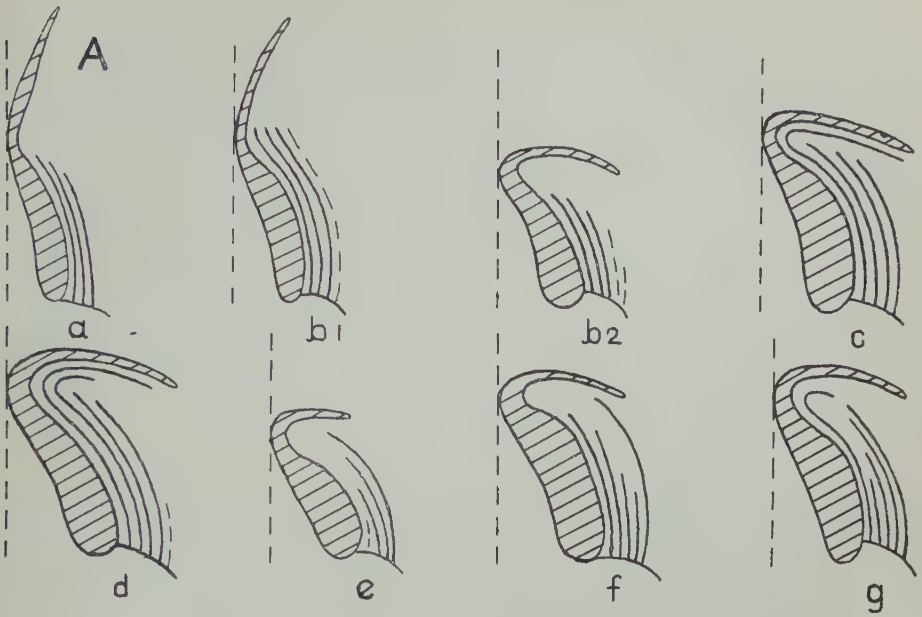
A third species, where the heterophylly is observed, is *D. pteropoda*, but it is developed here to a still lesser degree; this species again belongs to the group of species with completely amplexicaul petiolar wings.

5. Inflorescence. The inflorescences of *Dillenia* are racemose. A simple raceme is found in a number of species. This may be reduced to a solitary flower, sometimes with an articulation indicating the transition from peduncle to pedicel, but usually with a pedicel without such an articulation. Or there is a composed raceme, in which case the branches take the place of the second flower and sometimes one or more flowers above this one. Branching for the second time is found only, and even here rarely, in *D. albiflos*, in which species the inflorescence has up to 4 branches which are in itself simple racemes.

6. Corolla. The corolla usually consists of 5 free petals, which fall off within half a day after the flower has opened. In some species, however, the corolla is absent (*D. celebica*, *D. serrata*, *D. eximia*). 4 or 6 petals are occasionally found in *D. fischeri*. In one species I have seen double flowers (*D. castaneifolia*). In a number of species in the easternmost part of the area of the genus the corolla falls as a whole without spreading; after the corolla has fallen the stamens and styles exceed the calyx, where only a small opening is left at the apex (fig. 4).

7. Androecium. The structure of the androecium is one of the major characters for the identification of the species. As to this character

Fig. 2 — A. a—g. Schemata of the different types of androecium; the letters are the same as used in the text (cf. p. 14); B & C. distribution of these different types; the occurrence of type d in W. Java is probably due to introduction.


A
a
b
b2
c
d
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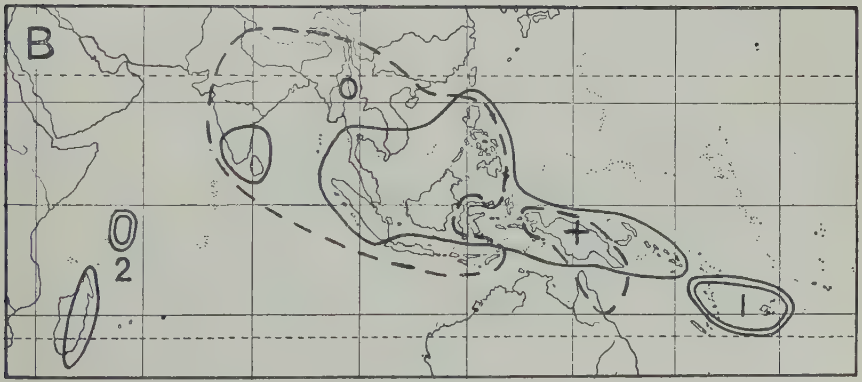
g


B
0
0
2
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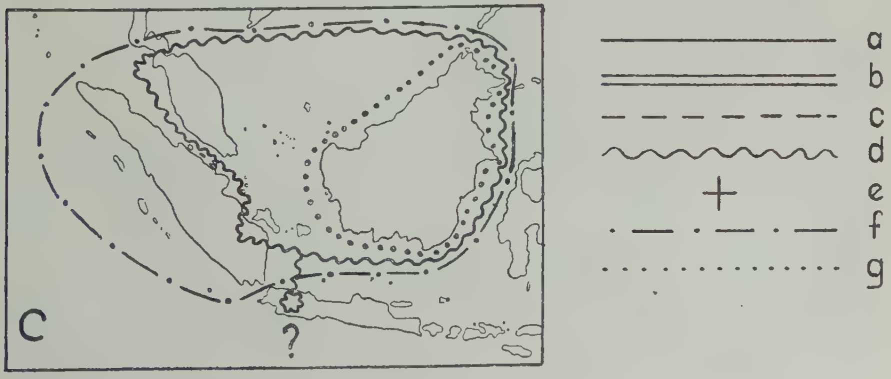
1


C
?
a
b
c
d
+
e
f
g

a number of variations is found on the following two principles: reduction of part of the stamens to a distinct group of staminodes, and differentiation between the stamens by differences in length, resulting in the presence of 2 sharply separated groups or 2 groups with a relatively small number of stamens of intermediate lengths. The following types may be distinguished (cf. fig. 2):

a. All stamens of about the same length; no staminodes or only few of the outermost stamens reduced to staminodes, the latter not forming a distinct group, with transitions in reduction of the thecae (shorter in some of the outermost stamens): species 1—16, 32, 35—37, 49.

b. All stamens of about the same length; a distinct group of staminodes on the outer side of the androecium; 2 types can be distinguished:

b 1. Staminodes about as long as stamens; stamens slightly longer than carpels; styles only slightly diverging: species 17.

b 2. Staminodes shorter than stamens; stamens distinctly shorter than carpels; styles spreading: species 18.

c. Innermost stamens longer than the outer ones, in bud and often also in the open flower reflexed outward over these; these groups not always sharply separated; no staminodes or only few of the outermost stamens reduced to staminodes (cf. a): species 19—29, 34?, 38—48, 50—55.

d. Stamens like in preceding group; a distinct group of staminodes on the outer side of the androecium: species 30.

e. Stamens gradually decreasing in length towards the centre of the flower; a distinct group of staminodes between the stamens and carpels: species 31.

f. Stamens in 2 distinct groups: an outer whorl of stamens of the same length, immediately within this whorl stamens less than half as long, the length gradually increasing towards the centre, the innermost ones nearly as long as the outermost ones: species 33.

g. Stamens in 2 distinct groups: those of the outer group gradually diminishing in length towards the centre, the innermost ones of this group less than half as long as the outermost ones, those of the inner group (one whorl) slightly longer than the outermost ones of the outer group, with small apical part reflexed outward in bud: species 34.

In addition there is some variation in the dehiscence of the stamens. In most species the thecae open with pores at or closely near the apex, in others with longitudinal slits. This character appears to be of restricted taxonomic value as two closely related species may differ regarding this character (*D. celebica* and *D. serrata*).

8. Gynoecium. The conical protruding part or the receptacle around which the carpels are arranged is characteristic for the genus. The presence of a cavity above the apex of this cone, included by the apical part of the carpels, is striking at least in a number of species, probably in all. Whether this cavity has a function is difficult to say; like the carpels it may contain a transparent slime.

The absence of a distinct stigma in nearly all species is remarkable; a distinct, knob-like stigma is found only in *D. celebica* and *D. serrata*. The pollen is collected on the whole surface of the styles, most of it in the centre of the gynoecium where the styles meet. The apex of the style has a small opening, which is partly filled with small papillae and is the end of the internal stylar canal. The pollen tubes of the pollen collected near the apex of the styles grow into this canal; there are no indications that the pollen tubes may penetrate at other places (observations in the Botanic Garden, Bogor, kindly communicated by Miss J. T. de Vries).

9. Fruit and seed. Formerly it was often supposed that the character of the indehiscent fruit was connected with the absence of an aril; it appears, however, that several species with indehiscent fruit have distinctly arillate seeds, whereas all species with dehiscent fruit have arillate seeds. Pierre (1879, under *D. hookeri*) has suggested that the outermost layer of the seed in *Dillenia* s.s. (the exarillate species) would represent the aril. Svedelius (1911) showed that the structure of the seed-wall in *Dillenia* s.s. and *Wormia* (the arillate species) is identic. He found in young stages of the seed of *Dillenia* s.s. a rudimentary aril on the funicle which disappears in the course of development.

Anatomy.

For the general anatomy of the genus I may refer to Baillon (Adansonia 7, 1866—7, pp. 88—93), Solereder (Syst. Anat. Dicot., 1899, pp. 23—28 & Suppl., 1908, pp. 3—4), and Gilg & Werdermann (1925, p. 8), for the wood anatomy to Moll & Janssonius (1906, l. c.) and Pearson & Brown (1932, l. c.). In the anatomy of the wood no character is found to support the distinction of *Wormia* as a separate genus (Moll & Janssonius, note under *Wormia excelsa*, the only species of *Wormia* examined by them).

Geographical distribution.

The genus occurs from Madagascar to the Fiji Islands, extending in the North to the southern Himalaya slopes, Yunnan, and Hainan; in Australia it is found only on the East coast of Northern Queensland (fig. 1a). I have indicated already the remarkable distribution of the insertion of the petiole (cf. p. 8 and fig. 1a & b). The distribution of the different types of androecium is given in fig. 2B & C. The remarkable corolla which falls off as a whole without spreading is distributed throughout the easternmost part of the area (mainly in and E of New Guinea); the fully expanding corolla is perhaps not found E of New Guinea, but not all species from this area are sufficiently known to indicate exactly the eastern limit of the occurrence of this character.

The number of local endemics is rather high, particularly in the eastern part of the area of the genus. The two species with the largest area are *D. indica* and *D. pentagyna*; the area of the latter is disjunct, being partly in the monsoon region of continental Asia, partly in that of E. Java, S. Celebes, and the Lesser Sunda Islands, separated by the everwet region from Sumatra to the Philippines. Several species are restricted to the Sunda shelf (Malay Peninsula, Sumatra, Borneo, partly also W. Java).

In the following list I give the major geographical regions with the species occurring in them; species endemic to the region concerned are indicated with an asterisk:

Madagascar: 7. *D. triquetra.*
Seychelle Islands: *18. *D. ferruginea.*

Ceylon: 7. *D. triquetra*, *43. *D. retusa*, 47. *D. indica*.

India (Pakistan included, Burma excluded): *36. *D. bracteata*, 47. *D. indica*, 50. *D. pentagyna*, 51. *D. scabrella*, 54. *D. aurea*.

Burma: *35. *D. mansoni*, 47. *D. indica*, *49. *D. parkinsonii*, 50. *D. pentagyna*, 51. *D. scabrella*, 52. *D. parviflora*, 54. *D. aurea*, 55. *D. obovata*.

China: 45. *D. turbinata*, 47. *D. indica*, 50. *D. pentagyna*.

Siam: 32. *D. eximia*, 37. *D. hookeri*, 38. *D. excelsa*, 46. *D. ovata*, 47. *D. indica*, 50. *D. pentagyna*, 52. *D. parviflora*, 54. *D. aurea*, 55. *D. obovata*.

Indo-China: 37. *D. hookeri*, *40. *D. blanchardii*, 45. *D. turbinata*, 46. *D. ovata*, 47. *D. indica*, 50. *D. pentagyna*, 51. *D. scabrella*, 55. *D. obovata*.

Andaman and Nicobar Islands: 50. *D. pentagyna*, *53. *D. andamanica*.

Sumatra: 30. *D. suffruticosa*, 32. *D. eximia*, 33. *D. reticulata*, 38. *D. excelsa*, 41. *D. sumatrana*, 46. *D. ovata*, 47. *D. indica*, 48. *D. pulchella*, 55. *D. obovata*.

Malay Peninsula: *2. *D. albiflos*, 30. *D. suffruticosa*, 32. *D. eximia*, 33. *D. reticulata*, 38. *D. excelsa*, 41. *D. sumatrana*, 46. *D. ovata*, 47. *D. indica*, 48. *D. pulchella*, 55. *D. obovata*.

Java: ?30. *D. suffruticosa* (introduced only?), 38. *D. excelsa*, 47. *D. indica*, 50. *D. pentagyna*, 55. *D. obovata*.

Lesser Sunda Islands: 13. *D. papuana*, 50. *D. pentagyna*.

Borneo: *1. *D. beccariana*, 30. *D. suffruticosa*, 32. *D. eximia*, 33. *D. reticulata*, *34. *D. borneensis*, 38. *D. excelsa*, 41. *D. sumatrana*, 47. *D. indica*, 48. *D. pulchella*.

Philippines: *5. *D. fischeri*, 6. *D. pteropoda*, *22. *D. bolsteri*, *23. *D. diantha*, *26. *D. megalantha*, *27. *D. philippinensis*, *28. *D. marsupialis*, *29. *D. reifferscheidia*, 38. *D. excelsa*, *39. *D. luzoniensis*, *42. *D. sibuyanensis*, *44. *D. monantha*.

Celebes: *3. *D. celebica*, *4. *D. serrata*, *25. *D. ochreata*, 50. *D. pentagyna*.

Moluccas: 6. *D. pteropoda*, 8. *D. ovalifolia*, *24. *D. talaudensis*.

New Guinea: 8. *D. ovalifolia*, *9. *D. quercifolia*, 10. *D. schlechteri*, *11. *D. montana*, 13. *D. papuana*, 19. *D. alata*, *20. *D. auriculata*, *21. *D. castaneifolia*.

Bismarck Archipelago: 10. *D. schlechteri*.

Australia: 19. *D. alata*.

Solomon Islands: *12. *D. ingens*, *14. *D. crenata*, *15. *D. salomonensis*, *16. *D. insignis*.

New Hebrides: 17. *D. biflora*.

Fiji Islands: 17. *D. biflora*.

Ecology.

Most of the species are found in everwet tropical forests, several with a pronounced preference to temporarily flooded habitat. Some species are more or less confined to savannahs (*D. hookeri*, *D. alata*), others are typically confined to regions with a dry period (e. g. *D. pentagyna*, where the disjunction of its area perfectly tallies with a more or less pronounced monsoon-climate). The character of being evergreen or deciduous does not follow exactly the climatic conditions, as some deciduous species are found in or even confined to everwet regions and some evergreen species extend their area to the periodically dry regions.

Most species occur in the tropical zone proper, i. e. below ca 1000 m, but some are occasionally found at higher altitudes, up to ca 2000 m. One species until now is known only from above 1000 m (*D. montana*).

Dispersal of the seeds occurs usually by animals. The larger, indehiscent fruits are eaten by mammals, whereas the arillate seeds of the species with dehiscent fruits are eaten by birds. Transport by water is a means of dispersal in *D. indica*, though this species is also dispersed by mammals (e. g. elephants).

Pollination may be effectuated by insects, but this is insufficiently known.

Vernacular names.

Practically all vernacular names, cited under the species, have been noted from herbarium labels. For the species occurring in India, however, the number of vernacular names cited in the literature is several times as large as the number of those noted on herbarium labels. For this area the vernacular names cited in this revision are a selection, taken from reliable sources in the literature, and besides giving some names of historical importance.

The Malay name "*simpur*" (*sempur, sempoh*) is used in western Malaysia for various species, often with an epithet, which usually is not specific. In the same way in the Philippines "*katmon*" is used for various species.

Uses.

The wood of *Dillenia* is generally of low value because of its short durability. Nevertheless it is sometimes used in house-building for interior purposes; it has a fine colour which makes its use for furniture attractive.

The large indehiscent fruit of some species is eaten either cooked or uncooked in jellies and curries; the taste is usually somewhat acid.

As ornamental trees or shrubs in tropical areas some species are suitable; as such *D. indica, D. ovata, D. philippinensis*, and *D. suffruticosa* are best known.

Miscellaneous notes.

1. In the citation of the literature a single asterisk indicates that the publication contains an uncoloured figure; a double asterisk indicates a coloured one.

2. The type specimens for the accepted name and for the synonyms are cited after the literature. The location of the holotype and eventually of the isotypes is indicated; if the holotype is lost (e. g. for specimens formerly preserved in the Berlin and Manila herbaria) a lectotype from the original material or, if not present, a neotype has been indicated for the accepted names only, not for the synonyms. If no holotype had been indicated in the original description, a lectoholotype has been chosen, for accepted names as well as for synonyms.

3. The sequence of the specimens studied, cited under each species, is based on geographical units. Some larger geographical units are distinguished (each in a separate paragraph) and within these, smaller units; for the latter I have followed local revisions or floras, e. g. Craib for Siam, the Flore Générale for Indo-China, Flora Malesiana Ser. I, Vol. 1 for Malaysia. Within these smallest units the sequence, as far as possible, is chronological.

4. In the lists of specimens the abbreviation *fl.* indicates that the specimen was in bud or in flower, *fr.* that the specimen was in young to ripe fruit; if not indicated or, sometimes, indicated with *veg.*, the specimen collected had no flowers or fruits at all. Not necessarily all duplicate specimens are complete.

5. Besides, the following abbreviations are found under the collectors in the citation of the specimens:

BNB	Forest Department British North Borneo.
BS	Bureau of Science, Manila.
CF	Conservator of Forests (Forest Institute, Kepong, Selangor).
FB	Forestry Bureau, Manila.
HB	Herbarium Bogoriense.
NGF	New Guinea Forces (or Forests?).
NIFS	Netherlands Indies Forest Service (Forest Research Institute, Buitenzorg (now Bogor), Java); Ja: Java series, bb: series bossen buitengewesten (islands outside Java).
PB	Piante Bornense (Beccari).
PNH	Philippine National Herbarium, Manila.
PP	Piante Papuane (Beccari).
PS	Piante Sumatrane (Beccari).
SF	Singapore Field number series.

Key to the species

1. Petiole with completely amplexicaul wings, in young leaf enclosing terminal bud, later on often partly or wholly caducous; leaf-scars consequently completely amplexicaul 2
Petiole at most with narrow, non-amplexicaul wings; leaf-scars clasping up to ¾ of branches, never completely amplexicaul 32
2. All stamens about equal, of about same length, slightly curved to nearly straight in bud, at most few staminodes on outer side of androecium, not forming a distinctly separated group 3
Stamens of different shape, either partly staminodial or innermost ones distinctly longer than outer ones and in bud reflexed outward over the latter, the two groups not always sharply separated 18
3. Petiolar wings more or less distinctly constricted below blade 4
No sharp delimitation of blade against petiolar wings present . **6. D. pteropoda**
4. Petiolar wings wholly persistent, in older leaves torn loose from base of blade and near base of petiole, but not caducous 5
Petiolar wings wholly or partly caducous along sharply fixed lines . . . 6
5. Inflorescences always unbranched; flowers ca 6½ cm across, yellow; carpels with 1½—2 mm long, rigid hairs . . . . **1. D. beccariana**
Inflorescences usually branched; flowers ca 5 cm across, white; carpels with 0.4—0.7 mm long, rigid hairs . . . . **2. D. albiflos**
6. Upper part of the petiolar wings persistent, lower part caducous 7
Petiolar wings wholly caducous 9
7. Flowers solitary; stamens ca 900, ca 7 mm long . . . . . **8. D. ovalifolia**
Flowers in 2—5-flowered inflorescences; stamens up to ca 100, ca 25 mm long 8
8. Carpels 8—10, densely hairy; leaves with 5—8 nerves on either side of midrib **16. D. insignis**
Carpels 5, glabrous; leaves with 9—14 nerves on either side of midrib **15. D. salomonensis**
9. Flowers apetalous; styles with distinct, knoblike stigma 10
Flowers with (caducous!) petals; styles acute at apex, without distinct, knoblike stigma 11
10. Petiolar wings linear to lanceolate; number of carpels ca 11 . . **3. D. celebica**
Petiolar wings half-obcordiform; number of carpels ca 18—19 . . **4. D. serrata**
11. Stamens obtuse at apex, never with long, distinct acumen 12
Stamens at apex with 1—2 mm long acumen . . . . . . **13. D. papuana**
12. Petiolar wings lanceolate to linear; leaves with up to 22, usually much less, nerves on either side of midrib 13
Petiolar wings broadly obovate; leaves large, with 22—30 nerves on either side of midrib . . . . **12. D. ingens**
13. Plants densely villose in younger parts; carpels 8—9 . . . . **11. D. montana**
Plants glabrous to densely sericeous in younger parts; if slightly villose carpels 4—7 14
14. Inflorescences partly terminal, partly lateral, axillary; number of petals and sepals 4—6, usually 5 . . . . **5. D. fischeri**

Inflorescences all terminal; number of sepals and petals in all flowers 5 . . 15
15. Inflorescences 3—20-flowered; carpels 4—5(—7); corolla fully spreading before falling; fruit indehiscent; species from Madagascar and Ceylon . **7. D. triquetra**
Inflorescences 2—6-flowered; carpels 6—11; corolla as far as known falling as a whole without spreading; fruit as far as known dehiscent; species from New Guinea and the Pacific Islands 16
16. Sepals glabrous or sparsely and very shortly hirsute outside 17
Sepals densely shortly hirsute outside with yellow to dark orange hairs **14. D. crenata**
17. Leaves elliptic, with 6—9 nerves on either side of midrib; sepals ca 15 × 12 mm **9. D. quercifolia**
Leaves ovate, with 13—21 nerves on either side of midrib; sepals ca 25 × 22 mm **10. D. schlechteri**
18. Androecium with distinct group of at least 50 staminodes, either on outer or on inner side 19
Androecium with at most small number of staminodes on outer side, these not forming distinct group from stamens but with transitions to the latter . . 22
19. Staminodes on outer side of androecium 20
Stamens gradually decreasing in size towards centre of flower; on inner side of androecium distinct group of staminodes present . . . . **31. D. fagifolia**
20. Stamens all of about same length, only slightly curved in bud 21
Innermost stamens longer than outer ones, with apical part reflexed outward in bud over the latter . . . . **30. D. suffruticosa**
21. Stamens about as long as or longer than carpels; thecae opening with terminal pore; inflorescences few-flowered (2—6); corolla falling as a whole without spreading . . . . **17. D. biflora**
Stamens distinctly shorter than carpels; thecae opening with longitudinal lateral slit; inflorescences many-flowered (ca 10—20); corolla fully spreading **18. D. ferruginea**
22. Sepals 5(—6) 23
Sepals at least 8, up to 17 31
23. Petiolar wings elliptic to nearly linear, at apex not or hardly exceeding insertion to petiole 24
Petiolar wings obovate, at apex distinctly exceeding insertion to petiole . . 29
24. Petiolar wings wholly caducous, at most small auricle persistent at apex . 25
Upper part of petiolar wings persistent . . . . **19. D. alata**
25. Petiolar wings elliptic-oblong; flowers large, more than 10 cm across; carpels 10—12 . . . . **27. D. philippinensis**
Petiolar wings lanceolate to linear; flowers smaller, ca 10 cm across or, usually, less; carpels 5—10 26
26. Leaves elliptic to oblong, subcoriaceous, 5—8-nerved; stylar canal and apical part of carpels hirsute inside . . . . **23. D. diantha**
Leaves elliptic-oblong to lanceolate, not or less coriaceous, 6—20-nerved; stylar canal and apical part of carpels glabrous inside 27
27. Apex of leaves acuminate; plants often rami- and cauliflorous; flowers whitish **22. D. bolsteri**
Apex of leaves obtuse to acute; plants never rami- or cauliflorous; flowers yellow 28
28. Leaves glabrous, 6—12-nerved; usually small auricle from petiolar wings persistent near base of blade . . . . **20. D. auriculata**
Leaves, at least when young, strigose on nerves beneath, 8—20-nerved; petiolar wings completely caducous . . . . **21. D. castaneifolia**
29. Carpels 6—9 . . . . **25. D. ochreata**
Carpels 14—16 30
30. Flowers solitary, large (ca 20 cm across); petiolar wings rounded at apex **26. D. megalantha**
Flowers in 2—3-flowered inflorescences, much smaller; petiolar wings obtuse, mucronate at apex . . . . **24. D. talaudensis**
31. Sepals 8—9, not much differing in size . . . . **28. D. marsupialis**
Sepals 11—17, distinctly increasing in size towards centre of flower **29. D. reifferscheidia**

32. Inflorescences or solitary flowers terminal on branches bearing normal leaves, later on often lateral, leaf-opposed on consequently sympodial branches . . 33

Flowers either axillary on leaf-bearing or, less often, leafless branches or in fasciculate inflorescences on older, defoliate branches in axils of leaf-scars, or terminal on short branches bearing only number of bracts at base . . . 48

33. Deciduous trees with stilt-roots; inflorescences appearing with leaves, often immediately at base with 2 or 3 branches, the whole forming a loose cluster . 34

Evergreen trees without stilt-roots; inflorescences only very rarely branched immediately at base; flowers either solitary or in racemose inflorescences . 36

34. Carpels 4—6; flowers apetalous; stamens all of about same length . **32. D. eximia**

Carpels 7—10; flowers with (caducous!) petals; stamens in 2 distinct groups . 35

35. Petiole densely sericeous above, nearly glabrous beneath; carpels 7—8 **34. D. borneensis**

Petiole more densely hairy beneath than above; carpels 9—10 . **33. D. reticulata**

36. Stamens all of about same length, only slightly curved in bud 37

Innermost stamens distinctly longer than outer ones, with apical part reflexed outward over the latter 39

37. Flowers in 2—9-flowered racemes; pedicel without or with 1—2 small bracteoles; leaves not densely velutinous beneath 38

Flowers solitary, rarely two together at same level; pedicel with 3 large verticillate bracteoles; leaves densely velutinous beneath . . . . **37. D. hookeri**

38. Young branches densely tomentose-hirsute; leaves retuse or rounded to obtuse at apex; number of stamens ca 230 . . . . **36. D. bracteata**

Young branches glabrous; leaves acute at apex; number of stamens ca 85 **35. D. mansoni**

39. Stamens of outer group gradually increasing in size towards centre of flower, outer group not sharply distinct from inner one 40

Stamens of outer group all of approximately same length, outer group sharply distinct from inner one 42

40. Sepals completely glabrous outside; carpels 4—5; flowers ca 10 cm across; fruit dehiscent . . . . **44. D. monantha**

Sepals hairy outside; carpels 5—7; flowers ca 6—8 cm across; fruit probably always indehiscent 41

41. Nerves curving upward, not reaching margin; flowers yellow; ovules 12—15 **40. D. blanchardii**

Nerves slightly curving upward, ending in margin; flowers white; ovules 22—34 **43. D. retusa**

42. Number of carpels 5—12 43

Number of carpels 14—20 . . . . **47. D. indica**

43. Leaves narrowly obovate to oblanceolate, about 3 times as long as broad, small (up to 6, rarely 9 cm long) . . . . **42. D. sibuyanensis**

Leaves oblong to oval, about 1½—2(—2½) times as long as broad, much larger 44

44. Inflorescences (3—)5—30-flowered, though not always all flowers present at the same time; fruits dehiscent 45

Flowers solitary or inflorescences 2(—4)-flowered; fruits indehiscent . . 46

45. Inflorescences racemose, simple racemes or composed, only slightly zigzag, with restricted growth, never lateral on defoliate branches; number of stamens of outer group ca 300, of inner group ca 25—35 . . . . **38. D. excelsa**

Inflorescences always simple racemes, distinctly zigzag, long-growing, older ones on defoliate branches opposite to leaf-scars; number of stamens of outer group ca 120, of inner group ca 50 . . . . **39. D. luzoniensis**

46. Leaves oblong, ca 2—2½ times as long as broad; flowers ca 6 cm across; connective in stamens of inner group of equal breadth for whole length **41. D. sumatrana**

Leaves ovate, obovate, or oval, ca 1½—2 times as long as broad; flowers ca 10—16 cm across; connective in stamens of inner group gradually broadening towards base 47

47. Flowers in 2—4-flowered racemes, ca 10—13 cm across; leaves obovate **45. D. turbinata**

Flowers solitary, ca 16 cm across; leaves ovate to oval . . . **46. D. ovata**

48. Evergreen species with axillary flowers on leaf-bearing branches or few-flowered racemes in axil of leaf-scars on young branches . . . . **48. D. pulchella**

Deciduous species with flowers or inflorescences on older, leafless branches; flowers solitary or in few-flowered fascicles 49
49. All stamens of about same length . . . . 49. **D. parkinsonii**
Stamens in two distinct groups, innermost ones much longer than outer ones, with apical part reflexed outward over the latter in bud 50
50. Thecae opening with longitudinal slit; flowers up to ca 5 cm across . . . 51
Thecae opening with apical pore; flowers ca 10—12 cm across 53
51. Sepals densely sericeous outside . . . . 52. **D. parviflora**
Sepals glabrous on both sides 52
52. Pedicels without bracteoles . . . . 50. **D. pentagyna**
At least part of the pedicels with caducous bracteoles . . . 51. **D. scabrella**
53. Outer sepals ca 15 × 12 mm, inner ones ca 18 × 14 mm; stamens of outer group ca 7 mm long . . . . 53. **D. andamanica**
Outer sepals at least 25 × 18 mm, inner ones at least 30 × 20 mm; stamens of outer group at least 10 mm long 54
54. Adult leaves obovate-oblong, abruptly and often unequally narrowed into 3—6½ cm long petiole; flowers ca 10—12 cm across; pedicel ca 5—12 cm long, rarely shorter . . . . 54. **D. aurea**
Adult leaves obovate, gradually narrowed into 1.3—4 cm long petiole; flowers ca 14—16 cm across; pedicel up to 4, rarely 5 cm long . . . 55. **D. obovata**

1. Dillenia beccariana Martelli 1886

Dillenia beccariana Martelli in Becc., Malesia 3, 1886, p. 158; Merr., Bibl. En. Born. Pl., 1921, p. 382; Hoogl., Fl. Mal. I, 4, 1951, p. 158.

Wormia beccariana (Martelli) Ridl., Saraw. Mus. J. 1, 1913, p. 71.

Type specimen: Beccari PB 134, Kuching, Sarawak, July 1865; lectoholotype in FI, isotypes in BM, BZ, G, K, M, P, S.

Small evergreen trees, up to 6 m high. Branches sympodial, younger ones ca 3—4 mm thick, hirsute to densely hirsute, most densely so in axil of leaves or leaf-scars, glabrescent. Leaf-scars amplexicaul, for about $^1/_3$ single line, bent downward in centre of leaf-opposed side, for about $^2/_3$ semi-lunular, emarginate above, with ca 17 leaf-traces near lower margin. *Leaves* oblong to narrowly obovate, 18—30(—45) × 8—12(—16) cm, with (18—)20—25(—30) nerves on either side; obtuse, often more or less acuminate at apex, rounded to obtuse at base, for $1^1/_2$—2 mm connected with petiolar wings; margin slightly to manifestly dentate, nerves rather straight, curving upward near margin, ending in apex of teeth; glabrous to sparsely hirsute on intervenium, densely hirsute on midrib, less densely so on basal part of nerves above, hirsute, most densely so on midrib, nerves, and veins beneath. Petiole 3—6 cm, glabrous above, more or less densely hirsute beneath, with amplexicaul wings; wings lanceolate, 4—9 mm broad near base, gradually narrowing to $1^1/_2$—2 mm at apex, in young leaves connected with base of blade, in older leaves torn loose here and near base of petiole, persistent, glabrous above, more or less densely hirsute beneath. *Inflorescences* terminal, racemes, up to 20-flowered, up to 60 cm; axis more or less distinctly zigzag, ca 3—2 mm thick, hirsute; bracts caducous, sessile, ovate, 8—20 × 6—12 mm, acute at apex, rounded at base, glabrous above, hirsute beneath. *Flowers* ca $6^1/_2$ cm across. Pedicel 7—12 mm, ca $1^1/_2$ mm thick, thickened to 2 mm at apex, hirsute, without or with 1 very small bracteole. Sepals 5, oval to ovate, 2 outermost ones slightly smaller (ca 17 × 14 mm) than 3 innermost ones (ca 20 × 15 mm), glabrous inside, appressed-sericeous outside, most densely so in central part, densely ciliate at margin. Petals 5, yellow, obovate, ca 33 × 22 mm, rounded at apex, narrowed towards base. Stamens ca 130, slightly curved in bud, all of about same length (outermost ones only slightly shorter), 11—13 mm; filament flattened, $1^1/_2$—3 mm long, 0.4—0.6 mm broad; anther ca 0.5—0.7 mm broad, obtuse at apex; thecae linear, opening with pore near apex on outer side. Carpels 5—6, arranged around conical receptacle, with conical part about half as high as carpels, lanceolate, ca 8—10 × 2 mm, each with ca 20 ovules; styles spreading, cylindric, ca 5 mm long, ca 0.4 mm thick at base, channelled above; carpels and base of styles densely covered with rigid, $1^1/_2$—2 mm long, glossy yellow, upward directed hairs. *Pseudocarps* dehiscent, carpels probably only slightly spreading; also when unripe sepals not completely enclosing gynoecium; carpels ca 25 × 16 mm, each with 1—3 seeds. Seeds obovoid, curved, ca 4 × $2^1/_2$ mm; aril 0.2—0.4 mm long, membranous.

Borneo: Sarawak: Kuching, *Beccari PB 134,* fl. July 1865 (BM, BZ, FI, G, K, M, P, S); Bantin, Batan-Lupar Prov., *Beccari PB 497,* fl. & fr. Sept. 1865 (FI, K); Kuching, *Beccari PB 3076,* fl. Jan. 1867 (FI, K, P); Tegora, *Haviland 2047,* fl. Dec. 1892 (K); Kuching, *Omar 367,* fr. Jan. 1924 (BZ, K, SING); Mt Singghai, *Nat. Coll. 5282,* fl. Feb. 1927 (NY, UC).

Distribution. Borneo; Sarawak only.

Ecology. At low altitude.

Vernacular names. *Petasi, Simpor,* or *Simpor delaki.*

Uses. Used for construction purposes.

Notes. 1. The colour of the petals has been noted by Haviland only.

2. The species is closely related to *D. albiflos* from the Malay Peninsula; cf. p. 23.

2. **Dillenia albiflos (Ridl. 1910) Hoogl. 1951**

Wormia albiflos Ridl., J. Str. Br. R. A. S. 54, 1910, p. 6; Ridl., Fl. Mal. Pen. 1, 1922, p. 9.

Wormia beccariana Auct. non (Martelli) Ridl.; Corn., Gard. Bull. S. S. 10, 1939, p. 4; Corn., Wayside Trees Malaya, 1940, p. 205.

Dillenia albiflos (Ridl.) Hoogl., Fl. Mal. I, 4, 1951, p. 158.

Type specimen: Ridley 11053, Tebing Tinggi, Johore, Nov. 1901; holotype in SING, isotype in K.

Large evergreen shrubs or trees, up to 17 m high, rarely with few stilt-roots. Bark red. Branches sympodial, younger ones 4—7 mm thick, sparsely to densely hirsute with $^1/_2$—1 mm long hairs, glabrescent, indument above leaf-scars and particularly near axillary buds semi-permanent. Leaf-scars amplexicaul, for about $^1/_3$ single line, for about $^2/_3$ semi-lunular, slightly emarginate above, with ca 20 leaf-traces spreaded mainly in central part. *Leaves* elliptic to oblong, (17—)20—30(—40) × ($7^1/_2$—)9—15(—20) cm, with (13—)20—30(—35) nerves on either side; rounded to acute, often slightly acuminate at apex, rounded to obtuse at base, for 1—2 mm connected with petiolar wings; margin slightly undulate to manifestly dentate, nerves rather straight, curving upward near margin, ending in apex of teeth or otherwise in margin; nearly glabrous to sparsely hirsute, most densely so on midrib above, sparsely to slightly hirsute, most densely so on midrib and nerves beneath. Petiole $2^1/_2$—4 cm, glabrous above, sparsely to densely hirsute beneath, with amplexicaul wings; wings lanceolate, 5—11 mm broad near base, gradually narrowing to 1—2 mm at apex, in young leaves connected with base of blade, in older leaves torn loose here and near base of petiole, persistent, glabrous above, sparsely to densely hirsute beneath. *Inflorescences* terminal, sometimes 2 together, racemose, rarely simple racemes, usually having lateral branches at place of second flower and often second, rarely third branch at some place higher up, 12—30-flowered, up to 50 cm; axes only slightly zigzag, ca 5—$2^1/_2$ mm thick, hirsute; bracts caducous, sessile, ovate, 7—18 × 5—11 mm, acute at apex, rounded at base, glabrous above, densely hirsute beneath. *Flowers* ca 5 cm across. Pedicel 5—20 mm, $1^1/_2$—2 mm thick, thickened to 2—4 mm at apex, hirsute, without bracteoles. Sepals 5, ovate, 2 outermost ones slightly smaller (ca 15 × 12 mm) than 3 innermost ones (ca 20 × 14 mm), densely appressed-sericeous outside, hairs on 3 innermost ones directed upward, on 2 outermost ones more spreading, all densely ciliate at margin. Petals 5, pale cream white, obovate, ca 20 × 13 mm, rounded at apex, narrowed towards base. Stamens ca 160, slightly curved in bud, all of about same length (outermost ones only slightly shorter), $5^1/_2$—8 mm; filament flattened, ca 1—$1^1/_2$ mm long, 0.4—0.6 mm broad; anther ca 0.5—0.7 mm broad, acuminate at apex; thecae linear, opening with pore near apex on outer side. Carpels 5—6, arranged around conical receptacle with conical part about half as high as carpels, lanceolate, ca $4^1/_2$ × $1^1/_2$ mm, each with ca 10 ovules; styles spreading, cylindric, slightly flattened, ca 5 mm long, ca 0.5 mm broad near base, 0.2 mm near apex, channelled above; carpels and base of styles rather densely covered with rigid, 0.4—0.7 mm long, silky, upward directed hairs. *Pseudocarps* dehiscent, sepals enlarged to 25 × 15 mm; carpels ca 10 × 12 mm, each with 1—2 seeds. Seeds reniform, ca 4 × 3 mm, minutely echinate; aril ca 1 mm long, membranous.

Malay Peninsula: Johore: Tebing Tinggi, *Ridley 11053*, fl. Nov. 1901 (K, SING); Kluang, *Holttum SF 9359*, fl. Nov. 1922 (A, BM, CAL, K, SING, UC); ibidem, *Watson CF 6062*, fl. July 1923 (IFI); Mawai, *Corner*, Nov. 1934 (SING); Kota Tinggi, *Corner*, fl. Feb. 1935 (SING); ibidem, *Corner SF 29300*, fl. Apr. 1935 (A, BM, BZ, IFI, K, SING); Sungai Kayu Ara, *Corner SF 29369*, fl. May 1935 (A, BZ, IFI, K, SING); Sungai Kaya, *Kiah SF 32016*, fl. Oct. 1936 (K, L, SING); Sungai Sedili, *Ngadiman SF 36850*, fl. July 1939 (SING); Bukit Tinjau Laut, *Corner SF 37059*, fl. Aug. 1939 (A, BZ, SING); Ayer Hitam road, *Corner*, Oct. 1941 (SING); Kota Tinggi, *Sinclair SF 38934*, July 1950 (L).

Cultivated: Singapore: from Gunung Panti, *Nur*, fl. Nov. 1946 (SING); Gardens Jungle, *Kiah SF 38310*, fl. Dec. 1948 (BM, L, SING).

Distribution. Malay Peninsula; SE. Johore only.

Ecology. In swampy forests, lowland hillside forests, and secondary forests. According to Corner (1940) flowering twice a year, after each spell of dry weather; flowers have been collected in most months, without indication of any periodicity.

Notes. 1. Corner indicates (field-note) that the bigger trees have bigger leaves, in contrast to what is usually found in *Dillenia* and most other tree genera.

2. From the closely related *D. beccariana* the present species differs by the usually composed inflorescence, the slightly smaller flowers (which character is indicated in the dimensions of all floral parts), the distinctly (also relatively) shorter indument of the carpels, and the colour of the petals. Corner (1940), who reduced *D. albiflos* to *D. beccariana*, points

out the remarkable distribution (SE. Malay Peninsula and Sarawak) which is found in more taxa; his remark still holds, as the two species are certainly closely related to each other and rather isolated within the genus.

3. Dillenia celebica Hoogl. spec. nov.

Dillenia celebica Hoogl., Fl. Mal. I, 4, 1951, p. 159, descr. angl..

Type specimen: Kjellberg 2226, Beao (Towuti), Celebes, 30 Aug. 1929; holotype in S, isotype in BZ.

Descriptio typi: Rami novelli glabri; cicatrices amplexicaules. Folia elliptico-oblonga, 9—13 × $4^1/_2$—$7^1/_2$ cm, 12—15-nervata, apice obtusa, subacuminata, basi obtusa, margine subundulata. Petiolus 4—6 cm, alatus alis anguste lanceolatis, amplexicaulibus, caducis. Inflorescentiae uni- vel biflores, terminales. Alabastra subglobosa, ca $1^1/_2$ cm diam., pedicello 2—3 cm. Sepala 5, ovalia, 21—25 × 16—19 mm, intus glabra, extus sericea, margine ciliata. Petala desunt. Stamina ca 300, conformia, ca 6—7 mm longa. Carpella 11, oblonga, ca 8 × $3^1/_2$ mm, glabra, 3—4-ovulata, stylis recurvatis ca 7 mm longis, stigmate pulvinato.

Fig. 3 c—e, p. 29.

Evergreen trees, up to ca 30 m high, 50 cm thick, with small buttresses. Bark greyish brown, slightly flaky in large plates; heartwood greyish red. Branches sympodial, younger ones ca 2 mm thick, glabrous to rather densely strigose or hirsute, most densely so above leaf-scars, glabrescent, later on often with many lenticels. Leaf-scars amplexicaul, for about $^2/_3$—$^3/_4$ single line, for about $^1/_3$—$^1/_4$ rather highly semi-lunular with ca 13 leaf-traces near lower margin. *Leaves* elliptic-oblong, (9—)13—18(—21) × ($4^1/_2$—)6—10(—12) cm, with (12—)15—20(—23) nerves on either side; obtuse to acute, often slightly acuminate at apex, rounded to obtuse at base, not connected with petiolar wings; margin undulate to dentate, nerves rather straight, curving upward near margin, usually closely following margin, not ending in it, less often ending in apex of teeth; glabrous above, glabrous on intervenium, glabrous to rather sparsely strigose-hirsute on nerves and midrib beneath. Petiole (4—)5—7(—8) cm, glabrous above, glabrous to rather sparsely strigose-hirsute beneath, with amplexicaul wings; wings linear to lanceolate, 2—5(—10) mm broad, slightly auriculate at apex, glabrous above, glabrous to rather densely strigose-hirsute beneath, wholly caducous. *Inflorescences* terminal, 1—5-flowered racemes, up to 5 cm and probably longer; axis $1^1/_2$—1 mm thick, nearly glabrous to rather densely hirsute, indument denser towards apex, without bracts. *Flowers* apetalous, ca $4^1/_2$ cm across. Pedicel 2—3 cm, ca 1 mm thick, thickened to 2 mm at apex, slightly to densely hirsute, indument denser towards apex, without bracteoles. Sepals 5, oval, ca 21—25 × 16—19 mm, glabrous inside, rather densely to densely sericeous, 5 in bud covered margins glabrous for breadth of ca 1 mm outside, finely ciliate at margin. Petals absent. Stamens ca 300, slightly curved in bud, all of about same length, 6—7 mm; filament $2^1/_2$—$3^1/_2$ mm long, ca 0.3 mm broad; anther ca 0.6 mm broad, obtuse or slightly emarginate at apex; thecae linear, opening with longitudinal, lateral slit. Carpels ca 11, arranged around conical receptacle, oblong, ca 8 × $3^1/_2$ mm, glabrous, each with 3—4 ovules; styles spreading, cylindric, ca 7 mm long, ca 0.7 mm thick near base, 0.4 mm at apex, with knob-like stigma, ca 0.8 mm diam., 0.3 mm thick. *Pseudocarps* unknown.

Celebes: N. Pen.: Manado, *Riedel HB 5899*, fl. (BZ, CAL, U); Ratahan, *Koorders 19382* β, March 1895 (BZ, K); Tondano, near Klabat, *NIFS bb 13755*, fl. Apr. 1929 (BZ, L). — SE. Pen.: Beao, Lake Towuti, *Kjellberg 2226*, fl. Aug. 1929 (BZ, S); ibidem, *Kjellberg 2226a*, Aug. 1929 (S).

Distribution. Celebes; known only from the eastern part of the North Peninsula and the region of Lake Towuti.

Ecology. In forest (*NIFS*) and on lake-shore (*Kjellberg*); these collections were made at ca 300 m altitude.

Vernacular names. *Njèher* (Ratahan), *Rerer* (Tonsean language, Klabat).

Uses. Used in house-building (*NIFS*).

Note. The species is closely related to *D. serrata*, from which it differs by the smaller flowers, the smaller number of carpels, and the shape of the petiolar wings; the two species have in common the absence of petals and the presence of a distinct, knob-like stigma, which is found in no other species of *Dillenia*.

4. Dillenia serrata Thunb. 1791

? Songium *Rumph., Herb. Amb. 2, 1741, p. 140, t. 45.

Sangius *Rumph., Herb. Amb. 2, 1741, p. 142, t. 46.

? Dillenia elliptica Thunb., Trans. Linn. Soc. 1, 1791, p. 200; DC., Syst. 1, 1818, p. 437; DC., Prod. 1, 1824, p. 76; Martelli in Becc., Malesia 3, 1886, p. 161; Merr., Int. Rumph. Herb. Amb., 1917, p. 367; Heyne, Nutt. Pl. Indon., 1950, p. 1071.

Dillenia serrata Thunb., Trans. Linn. Soc. 1, 1791, p. 201; DC., Syst. 1, 1818, p. 437; DC., Prod. 1, 1824, p. 76; Miq., Fl. Ind. Bat. 1, 2, 1859, p. 685; Merr., Int. Rumph. Herb. Amb., 1917, p. 368; Hoogl., Fl. Mal. I, 4, 1951, p. 158.

Type specimens: *Dillenia elliptica:* Rumphius, l. c., t. 45. — *Dillenia serrata:* Rumphius, l. c., t. 46.

Evergreen trees, up to ca 30 m high, ca 70 cm thick, with up to 16 m bole. Bark reddish grey, smooth, thinly scaling off; sapwood white, heartwood reddish brown. Branches sympodial, younger ones ca 4—5 mm thick, glabrous to densely sericeously strigose-hirsute, most densely so above leaf-scars, glabrescent. Leaf-scars amplexicaul, for about $^2/_3$ single line, for $^1/_3$ rather highly triangular with straight upper and rounded lower margin, with ca 15 leaf-traces near lower margin and in central part. *Leaves* oblong to lanceolate, (20—)25—35(—45) × (8—)10—14(—19) cm, with (16—)20—28(—35) nerves on either side; rounded to acute at apex, acute to obtuse at base, slightly decurrent, not connected with petiolar wings; margin dentate to nearly entire, nerves rather straight, either slightly curving upward near margin and ending in it directly, with strong vein upward along margin, or more strongly curving upward and not ending in margin, with strong vein ending in margin; glabrous above, glabrous on intervenium, glabrous to rather sparsely strigose-hirsute on nerves and midrib beneath. Petiole $2^1/_2$—$6^1/_2$ cm, glabrous above, glabrous to slightly sericeously hirsute beneath, with amplexicaul wings; wings half-obcordiform, at base 5—8, near apex 15—30 mm broad, glabrous above, glabrous to densely sericeously hirsute beneath, wholly caducous.

Inflorescences terminal, 2—6-flowered racemes, up to 15 cm; axis straight to rather tortuous, 4—2 mm thick, sparsely to densely sericeously hirsute; bracts caducous, lanceolate, up to 14 × 4 mm, glabrous above, sparsely to densely sericeously hirsute beneath. *Flowers* apetalous, yellow, ca $7^1/_2$ cm across. Pedicel 4—25 mm, $1^1/_2$—$2^1/_2$ mm thick, thickened to $3^1/_2$—5 mm at apex, sparsely to densely sericeously hirsute, without bracteoles. Sepals 5, oval, ca 40 × 25 mm, glabrous inside, densely sericeous, 5 in bud covered margins glabrous for breadth of 2—4 mm outside, not ciliate at margin. Petals absent. Stamens ca 750, slightly curved in bud, all of about same length (innermost ones gradually only slightly longer), 9—11 mm; filament $3^1/_2$—4 mm long, ca 0.4 mm broad; anther ca 0.6—0.7 mm broad, emarginate at apex; thecae linear, opening with apical pore. Carpels ca 18—19, arranged around rather broad conical receptacle, oblong, ca $4^1/_2 \times 1^1/_2$ mm, glabrous, each with 5—9 ovules; styles for ca 4 mm parallel, then spreading, filamentous, ca 8 mm long, ca 0.8 mm thick near base, narrowing to 0.4 mm at apex, with knob-like stigma, ca 1 mm diam., 0.4 mm thick. *Pseudocarps* indehiscent, yellow or yellowish green, appressed-globular, ca 6 cm diam., $3^1/_2$ cm high including enclosing sepals; sepals at apex somewhat divergent, leaving upper part of carpels uncovered, up to ca $6^1/_2 \times 5^1/_2$ cm, at base up to 3 mm thick; carpels yellow, more or less fleshy, ca 25 × 16 mm, up to 5-seeded. Seeds obovoid, ca 4 × $2^1/_2$ mm, black with reticulate surface, exarillate.

Celebes: Gulf of Bone, *Weber*, fl. (L). — N. Pen.: Palaleh, *van Andel*, fr. Dec. 1913 (BZ); Kwandang, near Titidu, *NIFS bb 7505*, fl. Sept. 1924 (BZ, L); Bal. Mangandon, near Buroko, *NIFS bb 13747*, July 1929 (BZ, L). — C. Cel.: G. Padang Kadjang, *Rachmat 834*, fl. 1913 (BZ); Malili, near Usu, *Waturandang 46 (Cel. III-39)*, fl. Nov. 1931 (BZ, L); ibidem, *Waturandang 147 (Cel. III-39)*, fl. Jan. 1932 (BZ); near Malili, *Waturandang 10 (Cel. IV-89)*, fl. & fr. Apr. 1932 (BZ); ibidem, *Reppie 160 (Cel. IV-155)*, fl. Apr. 1934 (BZ). — SW. Pen.: Palopo, near Padangalipan, *NIFS bb 13540*, Apr. 1929 (BZ). — SE. Pen.: Lepo-Lepo near Kendari, *Beccari*, fl. July 1874 (FI, K); Kendari, *Kjellberg 579*, fl. March 1929 (BZ, S). — Muna Isl.: Muna, *Ham L 7*, fr. (BZ); near Wangkoli, *NIFS bb 3924*, fl. Aug. 1922 (BZ, L); near Wasalangka, *NIFS bb 21129*, Aug. 1936 (BZ, K); ibidem, *NIFS bb 21131*, Aug. 1936 (A, BZ, L). — Buton Isl.: Kabungka, *Kjellberg 194*, fr. Feb. 1929 (BZ, S).

Distribution. Celebes.

Ecology. In primary and old secondary forest, from sea-level to ca 100 m altitude.

Vernacular names. *Dengen* (Buginese), *Dengilo* (Gorontalese), *Déngi wua* (Tobela language, To Padoë), *Dongi* (Tobela language, To Koronsië; Kaidipangese), *Dongi bolusu* (Tobela language, To Koronsië), *Soni(h)* (Munanese), *Wuadengi* (Tobela language, To Padoë).

Uses. The wood is used for planks, posts, and ledgers. According to Rumphius it is not durable. The fruits are edible (Rumphius).

Notes. 1. *Dillenia serrata* Thunb. is wholly based on *Sangius* Rumph.; the description and plate exactly match the present species. Rumphius already compared the species with *Dillenia* (Sangius, "quae Dilleniae quoque species est"); Linnaeus reduced it to *D. indica* (Sp. Pl. ed. 2, 1762, p. 754).

2. *Dillenia elliptica* Thunb. is wholly based on *Songium* Rumph.. The plate does not exactly match the present species, as the flowers are figured solitary; they are described as 2—3 together. As the figure of

Sangius is better and both binomials have been published at the same time whereas nobody has yet reduced one to the other, I prefer to retain *Dillenia serrata* as the correct name for the species.

3. The species is closely related to *D. celebica* (cf. p. 25).

5. Dillenia fischeri Merr. 1915

Dillenia fischeri Merr., Philip. J. Sc. Bot. 9, 1914, p. 518 (issued 1915); Merr., En. Philip. Fl. Pl. 3, 1923, p. 60; Hoogl., Fl. Mal. I, 4, 1951, p. 161.

Wormia fischeri (Merr.) Gilg & Werderm. in Engl. & Prantl, Nat. Pfl. Fam. ed. 2, 21, 1925, p. 35.

Type specimen: Miranda FB 20534, Butuan subprovince, Mindanao, Sept. 1913; lectoholotype (isotype) in P, isotypes in BM, K, US.

Evergreen trees, up to ca 20 m high. Branches sympodial, younger ones ca $1^1/_2$ mm thick, sparsely hirsute, reddish brown, glabrescent, greyish when older. Leaf-scars amplexicaul, for about $^2/_3$ single line, for about $^1/_3$ subfalcate with ca 7 leaf-traces in lower part. *Leaves* coriaceous, elliptic-oblong to oblanceolate, $6^1/_2$—14 × 2.8—$6^1/_2$ cm, with 7—11 nerves on either side; rounded at apex, obtuse to rounded at base, not connected with petiolar wings; margin nearly entire to dentate, mainly in upper part of leaf, nerves curving upward, branching ca 1—2 mm from margin, one branch towards margin, one in apical direction along margin, ultimately connecting with next nerve near its branching; shining, glabrous above, very sparsely strigose, soon glabrescent beneath. Petiole $1^1/_2$—3 cm, glabrous above, sparsely strigose-hirsute beneath, with amplexicaul wings; wings linear-lanceolate, ca 1 mm broad, narrowing towards apex, glabrous above, slightly strigose-hirsute beneath, wholly caducous. *Inflorescences* terminal on leaf-bearing or lateral in axil of leaf-scar on older branches, 2—4(—6)-flowered simple or, sometimes, composed racemes; axis up to 5 cm long, ca $1^1/_2$ mm thick, strigose-hirsute; bracts caducous, sessile, lanceolate, ca 12 × 4 mm, glabrous above, sparsely strigose-hirsute beneath. *Flowers* ca 6 cm across. Pedicel 3—6 cm, ca 1 mm thick, thickened to $1^1/_2$ mm at apex, strigose-hirsute, without bracteoles. Sepals 4—6, usually 5, obovate, 2 (when 4) or 3 outermost ones smaller (ca 13 × 8 mm) than 2 or 3 innermost ones (ca 16 × 12 mm), glabrous inside, sparsely strigose-hirsute outside, sparsely ciliate at margin, mainly near apex. Petals as many as sepals, white, obovate, ca 3 × 1.4 mm, rounded at apex, narrowed towards base. Stamens ca 120—160, slightly curved in bud, all of about same length, though slightly decreasing in size towards centre, outermost ones ca 9, innermost ones ca 7 mm; filament flattened, of outermost stamens ca $6^1/_2$ mm long, gradually decreasing to 3 mm in innermost ones, ca 0.2 mm broad; anther ca 0.6—0.7 mm broad, rounded at apex; thecae linear, opening with pore near apex on outer side. Carpels 4—6, usually 5, arranged around rather narrow conical receptacle, oblong, ca 7 × $2^1/_2$ mm, glabrous, each with 8—10 ovules; styles recurved, 5—8 mm long, 1—$1^1/_2$ mm thick at base, gradually narrowing to 0.3 mm at apex, channelled above. *Pseudocarps* unknown.

Philippines: Mindanao: Butuan Subprov., *Miranda FB 20534*, fl. Sept. 1913 (BM, K, P, US); ibidem, *Ponce FB 20500*, fl. Sept. 1913 (BM, L, NY, US).

Distribution. Philippines, known only from Mindanao, Butuan Subprovince.

Ecology. In semi-open forests at low altitude.

6. Dillenia pteropoda (Miq. 1868) Hoogl. 1951

Wormia pteropoda Miq., Ann. Mus. Bot. Lugd. Bat. 4, 1868, p. 77.

Dillenia papyracea Merr., Philip. J. Sc. Bot. 9, 1915, p. 520; Merr., En. Philip. Fl. Pl. 3, 1923, p 61.

Dillenia megalophylla Merr., Philip. J. Sc. 14, 1919, p. 421; Merr., En. Philip. Fl. Pl. 3, 1923, p. 60.

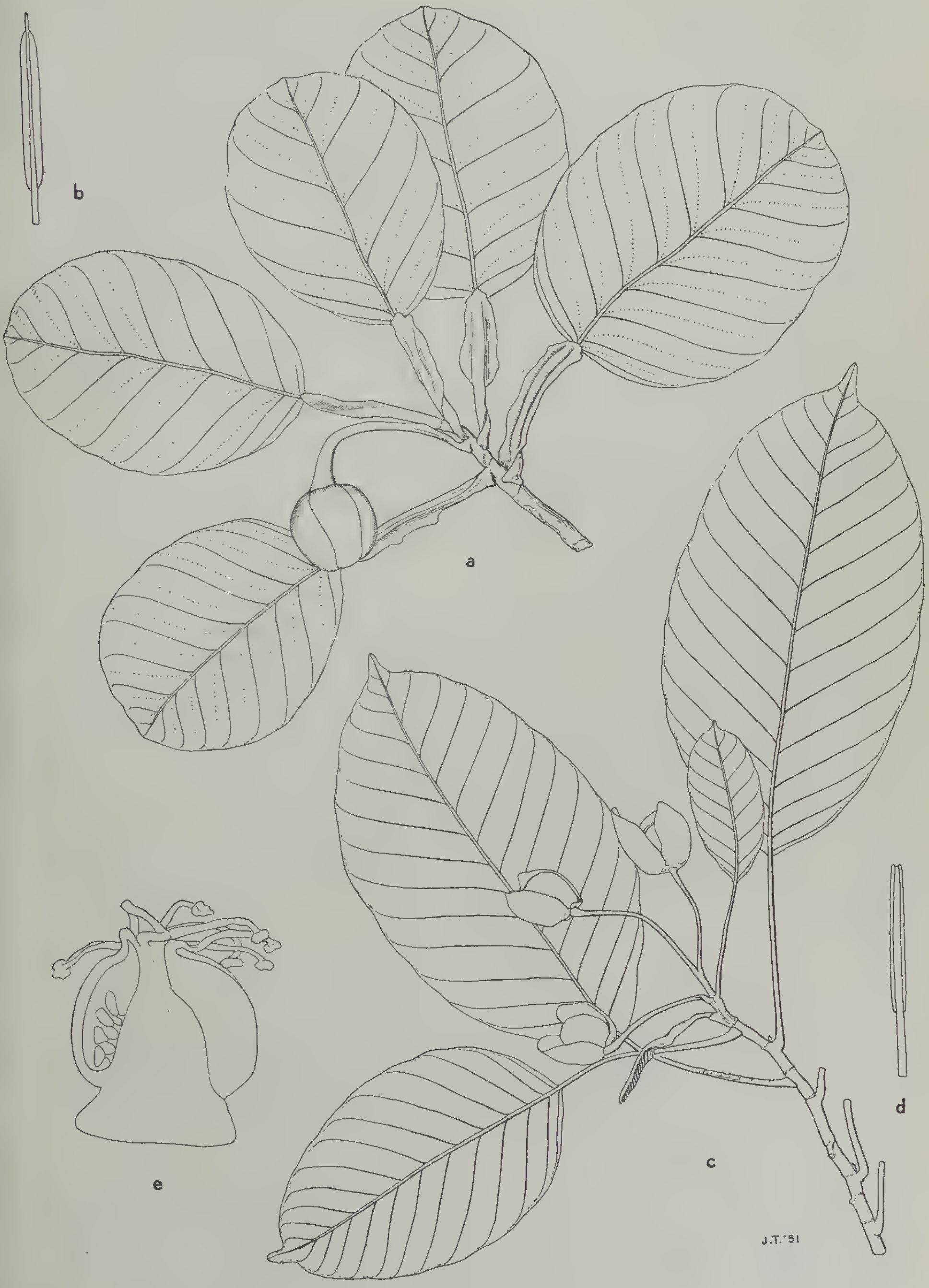
Wormia papyracea (Merr.) Gilg & Werderm. in Engl. & Prantl, Nat. Pfl. Fam. ed. 2, 21, 1925, p. 35.

Dillenia pteropoda (Miq.) Hoogl., Fl. Mal. I, 4, 1951, p. 158.

Type specimens: *Wormia pteropoda:* Teysmann 5535 HB, Halmaheira; holotype in U, isotypes in BZ, L. — *Dillenia papyracea:* Reillo BS 16339, Basilan, Sept. 1912; isotypes in K, US. — *Dillenia megalophylla:* Ramos BS 33034, Bangui to Claveria, Ilocos Norte Prov., Luzon, Aug. 1918; isotypes in A, K, P, US.

Evergreen trees, up to 40 m high, 1.25 m thick, with up to 27 m bole. Bark red-orange, peeling off in plates. Branches sympodial, younger ones ca 5—7 mm thick, sparsely strigose, glabrescent. Leaf-scars amplexicaul, for about $^1/_{10}$ single line, for $^9/_{10}$ subfalcate with ∞ (> 50) small leaf-traces in upper half. *Leaves* subcoriaceous, elliptic, (23—)30—60(—100) × (11—)16—35(—60) cm, with (15—)18—20(—23) nerves on either side; rounded to obtuse at apex, acute to obtuse at base, decurring into petiolar wings; margin entire to slightly undulate-dentate, nerves ending in apex of teeth, often also 1—3 secondary nerves directed downward near end of nerves, ending in apex of slightly smaller teeth; glabrous, slightly shining on both sides; midrib sharply prominent beneath, up to 8 mm thick. Petiole 5—10 cm, with amplexicaul wings; wings 7—25 mm broad, nervation of blade continuing, but less marked on wings, glabrous above, glabrous to rather softly pubescent beneath, often caducous, loosening irregularly from base of blade. *Inflorescences* terminal, 4—7-flowered racemes, up to 40 cm long; axis ca 5—3 mm thick, velvety to nearly glabrous; bracts caducous, sessile, triangular, 6—9 × 3—4 mm. *Flowers* ca 10—12 cm across. Pedicel 5—50 mm, ca $2^1/_2$ mm thick, thickened to 5 mm at apex, without bracteoles. Sepals 5, oval, 2 outermost ones slightly smaller (ca 25 × 20 mm) than 3 innermost ones (ca 33 × 22 mm), glabrous inside, slightly to densely velvety with $^1/_2$—1 mm long hairs outside, sparsely ciliate at margin. Petals 5, white, obovate, 45—50 × 30—32 mm, rounded at apex, narrowed towards base. Stamens ca 700, slightly curved in bud, all of about same length, 14—18 mm; filament 5—8 mm long, 0.3—0.8 mm broad; anther ca 0.7—1.0 mm broad, obtuse or slightly emarginate at apex; thecae linear, opening with pore near apex on outer side; on outer side of androecium few staminodes, linear, 4—5 mm long. Carpels ca 10, arranged around conical receptacle, lanceolate, ca 10 × $3^1/_2$ mm, glabrous, each with ca 25 ovules; styles spreading, 8—10 mm long, 1 mm broad near

Fig. 3 — a, b. *Dillenia ovalifolia* Hoogl. (p. 33); a. branch with flowerbud, × ½; b. stamen, × 5; both after type specimen; c, d, e. *Dillenia celebica* Hoogl. (p. 24); c. branch with inflorescence and leaves, flowers in bud, × ½; d. stamen, × 5; e. gynoecium, longitudinal section, × 3; all after type specimen.


b
a
e
d
c
J.T. '51

base, channelled above. *Pseudocarps* dehiscent, not seen by me except unripe. Seeds (immature) 3 mm long, surrounded by basal, loose, somewhat cup-shaped aril.

Philippines: Luzon: Ilocos Norte Prov., between Bangui & Claveria, *Ramos BS 33034,* fl. Aug. 1948 (A, K, P, US). — Basilan: *Reillo BS 16339,* fr. Sept. 1912 (K, US). — Mindanao: Zamboanga Distr., *Stadtmiller, Ferraris, & Almagro FB 20099,* Sept.—Oct. 1912 (P); Lanao Prov., near Porog, *Lynn Zwickey 803,* fl. Nov. 1938 (A).

Moluccas: Halmaheira: *Teysmann 5535 HB* (BZ, L, U); *de Vriese,* 1857—61 (L); near A. Lebengon, *NIFS bb 23750,* Oct. 1937 (BZ, L). — Batjan Isl.: *Teysmann 5886 HB* (BZ, CAL, U); Masurung, *NIFS bb 23129,* Aug. 1937 (BZ, L, MO); ibidem, *NIFS bb 23146,* Aug. 1937 (BZ).

Distribution. Philippines (Luzon, Basilan, and Mindanao) and Moluccas (Halmaheira and Batjan); seems to be rare.

Ecology. In primary forests, in the Philippines at low altitude, in the Moluccas from 150 to 500 m.

Vernacular names. *Tukoran* (Lanao Prov., Mind.), *Gofote* (Alfurese, Batjan), *Hokowoto* (Wajoli language, Halmaheira), *Merah* or *Sela* (Batjan).

Notes. 1. Miquel based the species on leaves only; the later collections from the Moluccas are also sterile only. The shape of the leaf, however, is so characteristic that without doubt the Philippine specimens belong here. The description of the flower is wholly based on Philippine material (*Lynn Zwickey 803*).

2. *Teysmann 5886 HB* consists of leaves, probably from a coppice or young tree, and is referred here with some doubt. The number of nerves is larger (ca 40—50) than in the other specimens, the margin is distinctly and sharply dentate, and the petiolar wings are very little distinct from the blade, with the bud-enclosing part up to 10 cm long. In view of the leaf-dimorphism in *D. ferruginea* and *D. pentagyna,* where the leaves from saplings and young trees are more distinctly dentate than those from old trees, the specimen can be matched with the other collections.

3. *D. papyracea* and *D. megalophylla* differ in the length of the pedicel, being a few mm in *D. papyracea,* 3—5 cm in *D. megalophylla.* There is no other distinctive character and therefore the species are considered here as identic. *Lynn Zwickey 803* in this character agrees with *D. papyracea.*

7. Dillenia triquetra (Rottb. 1783) Gilg 1893

Wormia triquetra *Rottb., Nye Samml. Vidensk. Selsk. Skrift. 2, 1783, p. 532, t. 3; DC., Syst. 1, 1818, p. 434; DC., Prod. 1, 1824, p. 75; Schlechtend., Linnaea 8, 1833, p. 179; Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 67; Hook.f. & Thoms., Fl. Br. Ind. 1, 1872, p. 35; **Trim., Handb. Fl. Ceyl. 1, 1893, p. 11, atlas t. 3; *Fairchild, J. Hered. 18, 1927, p. 328 (photo of leaf-base); Abeyesundere & de Rosayro, Draft of 1st Checkl. Ceyl., 1939, p. 18.

Dillenia dentata *Thunb., Trans. Linn. Soc. 1, 1791, p. 201, t. 20.

Lenidia madagascariensis Poir., Encycl. Suppl. 3, 1813, p. 330.

Wormia madagascariensis (Poir.) DC., Syst. 1, 1818, p. 433; *Delessert, Ic. Sel. Pl. 1, 1821, p. 21, t. 82; DC., Prod. 1, 1824, p. 75; Perrier, Not. Syst. 12, 1946, p. 210; *Perrier, Fl. Madag. fam. 132, 1951, p. 3, f. 1.

Wormia dentata (Thunb.) DC., Syst. 1, 1818, p. 434; DC., Prod. 1, 1824, p. 75.

Lenidia dentata (Thunb.) Poir., Dict. Sc. Nat. 25, 1822, p. 448.

Lenidia triquetra (Rottb.) Poir., Dict. Sc. Nat. 25, 1822, p. 448.

Wormia artocarpifolia Baker, J. Linn. Soc. Bot. 20, 1883, p. 88.

Dillenia triquetra (Rottb.) Gilg in Engl. & Prantl, Nat. Pfl. Fam. 3, 6, 1893, p. 123.

Dillenia artocarpifolia (Baker) Martelli ex Dur. & Jacks., Ind. Kew. Suppl. 1, 1902, p. 136; Hochr., Ann. Cons. Jard. Bot. Genève 11 & 12, 1908, p. 70.

Dillenia madagascariensis (Poir.) Martelli ex Dur. & Jacks., Ind. Kew. Suppl. 1, 1902, p. 136; Hochr., Ann. Cons. Jard. Bot. Genève 11 & 12, 1908, p. 70.

Dillenia guillotii Hochr., Ann. Cons. Jard. Bot. Genève 11 & 12, 1908, p. 70.

Wormia madagascariensis f. typica Perrier, Not. Syst. 12, 1946, p. 211; *Perrier, Fl. Madag. fam. 132, 1951, p. 4, f. 1: 1—4.

Wormia madagascariensis f. guillotii (Hochr.) Perrier, Not. Syst. 12, 1946, p. 211; *Perrier, Fl. Madag. fam. 132, 1951, p. 6, f. 1: 5—6.

Type specimens: *Wormia triquetra:* holotype in C. — *Dillenia dentata:* herb. Thunberg, Ceil.; holotype in UPS, original of Thunberg's figure, not seen. — *Lenidia madagascariensis:* Herb. du Petit-Thouars, Madagascar; lectoholotype in P, isotype in K. — *Wormia artocarpifolia:* Baron 1596, Central Madagascar; holotype in K, isotype in P. — *Dillenia guillotii:* Guillot 53, Vatomandry Distr., Madagascar, 25 Oct. 1903; holotype in G.

Evergreen trees, up to 20 m, usually ca 5—8 m high, up to ca 30 cm thick. Wood reddish. Branches sympodial, younger ones ca 2—4 mm thick, glabrous to densely sericeously villose, glabrescent. Leaf-scars amplexicaul, for about $^2/_3$—$^1/_2$ single line, for $^1/_3$—$^1/_2$ semi-lunular, emarginate above, with ca 11—13 leaf-traces in lower half. *Leaves* subcoriaceous, oval to oblong or obovate, (6—)10—20(—30) × (4—)7—12(—19) cm, with (5—)7—12(—14) nerves on either side; rounded or often more or less retuse to truncate at apex, obtuse to rounded at base, not or very little connected with petiolar wings, very little decurrent; margin entire to distinctly undulate, nerves slightly curving upward, ending directly or through vein in margin; glabrous, feebly shining above, glabrous on intervenium, sericeously villose, glabrescent on midrib and nerves beneath. Petiole (3—)4—10(—13) cm, glabrous above, slightly to densely sericeously villose, more or less soon glabrescent beneath, with amplexicaul wings; wings linear-lanceolate, 3—8 mm broad near base, gradually narrowing to $^1/_2$—1$^1/_2$ mm at apex, glabrous above, slightly to densely sericeously villose beneath, wholly caducous. *Inflorescences* terminal, racemose, (3—)5—12(—20)-flowered, up to 25 cm long, simple racemes or composed by having branches at place of second, rarely also third flower; axis 4—2 mm thick, glabrous to densely sericeously villose, glabrescent; bracts caducous, triangular to lanceolate, up to 15 × 4 mm, glabrous above, glabrous to densely sericeously villose beneath. *Flowers* ca 6—7 cm across. Pedicel 7—40 mm, 1$^1/_2$—2$^1/_2$ mm thick, thickened to 3—4 mm at apex, glabrous to densely sericeously villose, without bracteoles. Sepals 5(—6), 2 outermost ones about circular, ca 13 mm diam., 3(—4) innermost ones oval, ca 17 × 13 mm, all glabrous or 2 outermost ones very sparsely sericeous near apical margin only inside, glabrous to densely sericeously villose, in bud covered margins for breadth of ca 5 mm glabrous outside, sparsely ciliate at margin. Petals 5, white, obovate, ca 30 × 20 mm, rounded at apex, narrowed towards base. Stamens ca 125—140, yellow, slightly curved in bud, all of about same length, ca 8 mm; filament 2—2$^1/_2$ mm long, 0.2—0.4 mm broad; anther ca 0.5—0.7 mm broad, obtuse to acute at apex; thecae linear, opening with pore near apex on outer side. Carpels 4—5(—7), arranged around rather broad conical receptacle, elliptic-oblong, ca 3—3$^1/_2$ × 1$^1/_2$—2 mm, glabrous, each with 7—12 ovules; styles parallel to slightly spreading, filamentous, 6—8 mm long, ca 0.3—0.4 mm thick at base, ca 0.1 mm near apex. *Pseudocarps* indehiscent, oval, up to ca 25 × 20 mm including enclosing sepals which are ca 25—30 × 16—20 mm; carpels ca 10 × 6 mm, each with 1—2 seeds. Seeds obovoid, ca 5 × 3 mm, dark glossy brown, enclosed by membranous aril.

Madagascar: *herb. Lamarck,* fl. (P); *du Petit-Thouars,* fl. (BM, K, P); *Commerson,* fr. (P); Tacca Souhra, *Bojer,* fl. (C); near Nosy-Vé, *Chapelier,* fl. (P); Fort Dauphin, *Cloisel 93,* fl. (P); ibidem, *Scott Elliot 2469,* fr. May (E); ibidem, *Scott Elliot 2823,* fl. June (BM, E, K); Sasifour, *Boivin,* Apr. & Nov. 1831 (P); Sainte Marie, *Boivin,* fl. 1847—52 (P); Lac Nosy-Vé, *Humblot 336,* fl. & fr. Sept. 1882 (K, P); Central Madagascar, *Baron 1596,* fl. (K, P); ibidem, *Baron 2625* (K, P); ibidem, *Baron 5985,* fl. March 1891 (K, P); Vatomandry Distr., *Guillot 53,* fr. Oct. 1903 (G); Mananjary, *d'Alleizette 40,* fl. March 1906 (L); ibidem, *Geay 7235, 7261, 7344, 8043,* fl. & fr. March—Apr. 1909 (P); near mouth of Matitana, *Perrier de la Bathie 10127,* fl. Oct. 1911 (P); near Vatomandry, *Perrier de la Bathie 14098,* fl. Sept. 1911 (P); forêt de Campina (East Coast), *Louvel 238,* fl. Nov. 1923 (P); near Ambodiriana, W of Tamatave, *Perrier de la Bathie 17409,* fl. Dec. 1925 (P); Vondrozo, Farafangana Prov., *Decary 5253,* fl. Sept. 1926 (P); near Fort Dauphin, *Decary 10934 & 11056,* fl. Nov. 1932 (P).

Ceylon: *herb. Burman,* fl. & fr. (C, L); *Champion,* fl. (CGE, GL); *herb. Houttuyn,* fl. (G); *König,* fl. & fr. (BM, C, L); *herb. van Royen,* fl. & fr. (L, LINN); *Rostrup 120,* fl. & fr. (C); *Thwaites CP 1013,* fl. & fr. (BM, CAL, CGE, G, K, NY); *Walker,* fl. (G, K, OX); *Walker 1020,* fl. (E, P); *Wight 12,* fl. (E); Peradeniya, *Macrae 301,* fl. Feb. (CGE, K); fl. 1831 (K); March 1836 (NY); *Wight 7,* fl. March 1836 (E); *Kelaart,* fl. & fr. 1841 (G); *Wight,* fl. March 1849 (E); *Talmy 66,* fl. 1868 (P); Peradeniya, *Gamble 18745,* fl. Apr. 1887 (K); Delalure, *Simpson 8942,* fl. Nov. 1931 (IFI); Sinharaja, *Baker 2002,* fr. Aug. 1936 (BM).

Cultivated: Ceylon, Bot. Gard. Peradeniya: *Serell,* fl. 1844 (K); *Pearson 962,* fl. 1897 (CGE); *Pitch,* fl. May 1922 (A); *Director of Agriculture,* fl. March 1925 (IFI); *Fairchild 1079 & 1080,* fl. Jan. 1926 (UC). — Bot. Gard. Calcutta: *Pierre,* fl. & fr. 1883 (P). — Bot. Gard. Bogor: sub no IV-G-50, fl. and fr. (BZ, K, L).

Without data: material in C, E, GL, L, MEL, S, U.

Distribution. Madagascar, only in the eastern part, and Ceylon; localities in Ceylon according to Trimen: Ambagamuwa, Pusselawa, Colombo, Kurawita Korale.

Ecology. In forests at low altitude, in Ceylon ascending to ca 1000 m. In Madagascar flowering throughout the year, in Ceylon only from December to May.

Vernacular names. Madagascar: *Avi-hi-avi, Bararak(y), Baraté, Bararha, Rabaraba.* Ceylon: *Diyapara, Supara* (Singhalese).

Notes. 1. The two forms, distinguished by Perrier de la Bathie, differ mainly in the indument on the outer side of the sepals. I have not retained these forms as distinct taxa, as to my idea too many intermediate specimens are found. In Madagascar the glabrous form (*f. typica*) mainly occurs behind the littoral zone on more or less humid or sheltered habitat, the sericeous form (*f. guillotii*) in the littoral forest or on dryer places, exposed to severe sea-winds. I could not find out whether a similar ecological difference exists in Ceylon, where the two types are less distinct then in Madagascar. The type of the species belongs to the glabrous form.

2. Though they are geographically widely separated, I have not been able to find differences between the Ceylon and the Madagascar specimens, which justify the distinction of two species. The specimens from Ceylon

have generally larger leaves and longer inflorescences, but in all essential details the specimens are strikingly similar.

8. Dillenia ovalifolia Hoogl. spec. nov.

Dillenia alata (DC.) Martelli in Becc., Malesia 3, 1886, p. 157, quoad descr., non *Wormia alata* DC..

Dillenia ovalifolia Hoogl., Fl. Mal. I, 4, 1951, p. 159, descr. angl..

Type specimen: NIFS bb 30343, Isl. Japen near New Guinea, 3 Aug. 1939; holotype in L, isotype in BZ.

Descriptio typi: Rami novelli glabri; cicatrices amplexicaules. Folia subcoriacea, ovalia, 7—13 × 6—$9^{1}/_{2}$ cm, 8—11-nervata, apice et basi rotundata, glabra, supra lucida. Petiolus $4^{1}/_{2}$—6 cm, alatus alis amplexicaulibus, partim caducis. Flores solitarii, terminales, mox laterales, oppositifolii. Alabastra subglobosa, ca 2 cm diam., pedicello $5^{1}/_{2}$—$6^{1}/_{2}$ cm. Sepala 5, 2 exteriora 25—28 mm longa, 19—20 mm lata, 3 interiora 35—40 mm longa, 20—22 mm lata, basi ad 4 mm crassa, glabra, margine ciliata. Petala 5, in alabastro ad 25 mm longa, 18 mm lata. Stamina ca 900, conformia, 5—6 mm longa, apice acuminata. Carpella 7, glabra, lanceolata, ca 9 × $2^{1}/_{2}$ mm, ca 8-ovulata, stylis recurvatis ca 13 mm longis.

Fig. 3 a—b, p. 29.

Evergreen trees, up to 30 m high, 60 cm thick. Branches sympodial, younger ones 4—6 mm thick, glabrous or rather densely shortly sericeous, glabrescent. Leaf-scars amplexicaul, for about $^{2}/_{3}$ single line, for $^{1}/_{3}$ semilunular with ca 11—15 leaf-traces below middle. *Leaves* rather coriaceous, oval to nearly orbicular, 7—27 × 6—22 cm, with 8—13 nerves on either side; rounded at apex and base, base not connected with petiolar wings; margin slightly undulate, nerves rather straight, often slightly curving upward near margin, ending in margin; glabrous on both sides or rather densely shortly sericeous on basal part of midrib and lower nerves beneath; inconspicuous line present, most distinct in young leaves, in middle between nerves coming from axil of lower one, indicating line along which leaf is folded in bud. Petiole $4^{1}/_{2}$—10 cm, glabrous above, glabrous or rather densely shortly sericeous beneath, with amplexicaul wings; wings broadly linear, 5—10 mm broad, with rounded auriculate apex, auricles coherent with each other above petiole, extending slightly (ca 1 mm) above blade, glabrous above, glabrous or densely shortly sericeous beneath, partly caducous, for whole breadth at base, upper $^{2}/_{3}$—$^{1}/_{4}$ part wholly persistent, persistent part gradually narrowing towards base; petiole bearing at attachment horseshoe-shaped cushion. *Flowers* solitary, terminal, soon lateral, leaf-opposed, more than 6 cm across. Pedicel $5^{1}/_{2}$—7 cm, in transverse section triangular with 1 rounded and 2 sharp ribs, rounded one directed towards base of branch; at base 3—7 mm broad, 2—4 mm thick, at apex about terete, 5—6 mm thick; glabrous or densely shortly sericeous. Sepals 5, oval, 2 outermost ones 25—28 × 19—20 mm, 3 innermost ones 35—40 × 20—22 mm, glabrous inside, glabrous or densely shortly sericeous with in bud covered lateral margins glabrous outside, shortly ciliate at margin. Petals 5, white, obovate, in bud up to 25 × 18 mm, rounded at apex, narrowed towards base. Stamens ca 900, slightly curved in bud, all of about same length, ca 5—7 mm; filament 1—$1^{1}/_{2}$ mm long, 0.3 mm broad; anther ca 0.6 mm broad, long-acuminate at apex, connective exceeding thecae with 0.7—0.8 mm long, at base 0.2 mm broad acumen;

thecae linear, opening with apical pore. Carpels 7—8, arranged around rather broad conical receptacle, lanceolate, ca 9 × 2½ mm, glabrous, each with ca 8 ovules; styles spreading, ca 13 mm long, ca 1 mm thick at base, acute at apex. *Pseudocarps* dehiscent; carpels ca 17 × 10 mm, each with 0—1 seed. Seeds obovoid, ca 5 × 3½ mm, brown, at hilum black, enclosed by 3 mm long, membranous aril.

var. ovalifolia

Plants glabrous in all parts.

New Guinea: Japen Isl.: Ansus, *Beccari*, fl. Apr. 1875 (FI); *NIFS bb 30333*, fl. Aug. 1939 (BZ, L); *NIFS bb 30343*, fl. Aug. 1939 (BZ, L).

var. sericea Hoogl. var. nov.

Dillenia ovalifolia var. sericea Hoogl., Fl. Mal. I, 4, 1951, p. 159, descr. angl..

Type specimen: de Haan 1715, Halmaheira, Nucifera, Weda Distr., 25 Aug. 1949; holotype in L, isotypes in A, BRI, BM, BZ, C, CAL, G, K, NY, P, SING (not all isotypes seen by me).

Descriptio typi: Rami novelli et pedicelli, petioli et alae petiolares subtus, folia in parte basali costae mediae et nervorum basalium subtus, sepala extus breviter sericea.

Plants shortly sericeous on young branches and pedicels, on lower side of petiole and petiolar wings, on basal part of midrib and lower nerves beneath, and on outer side of sepals.

Moluccas: Morotai: G. Sangawo, *Main & Aden 984*, fl. & fr. May 1949 (BZ, L); G. Paré, *Main & Aden 1304*, fl. May 1949 (BZ, L). — Halmaheira: Nucifera, Weda Distr., *de Haan 1715*, fl. & fr. Aug. 1949 (BZ, L).

Distribution. *Var. ovalifolia* only in Japen Island, *var. sericea* only in the Moluccas (Halmaheira and Morotai).

Ecology. All collections were made in primary forest, in Japen and Morotai at 800—1000 m, in Halmaheira at 2 m altitude.

Vernacular names. Japen Isl.: *Karu ai* and *Wadajouw* (Ambai).

Note. The specimens belonging to *var. sericea* differ from those of *var. ovalifolia*, besides by the indument, by having a smaller part of the petiolar wings persistent. It is impossible to decide from the few collections whether these two characters are always connected with each other.

9. Dillenia quercifolia (White & Francis ex Lane-Poole 1925) Hoogl. 1951

Wormia quercifolia White & Francis ex Lane-Poole, Rep. For. Res. Terr. Papua & New Guinea, 1925, p. 116; *White & Francis, Proc. Roy. Soc. Queensl. 38, 1926, p. 242, f. 9 (issued 1927).

Dillenia quercifolia (White & Francis ex Lane-Poole) Hoogl., Fl. Mal. I, 4, 1951, p. 161.

Type specimen: Lane-Poole 226, Papua, mainland opposite Samarai, N. Div., Aug. 1922; holotype in BRI, isotypes in A, K, L.

Large evergreen trees, up to ca 35 m high, 120 cm thick, with up to 28 m bole. Bark yellow to reddish brown or red, peeling off in papery flakes. Wood pale yellow to rose brown. Branches sympodial, younger ones ca 2½ mm thick, glabrous. Leaf-scars amplexicaul, for about ½ single line, for ½ triangular with ca 15 leaf-traces in central part. *Leaves* oval, 8—15 × 4½—12 cm, with 6—9 nerves on either side; obtuse to rounded, minutely acuminate at apex, obtuse to rounded at base;

margin more or less undulate, nerves rather straight, curving upward near margin, not ending in it; wholly glabrous. Petiole 3—4 cm, glabrous, with amplexicaul wings; wings lanceolate, 3—7 mm broad, glabrous, with rounded apex not exceeding its insertion to petiole, wholly caducous. *Inflorescences* terminal, 2—4-flowered racemes, up to ca 5 mm long, with tortuous axis; axis ca 2—$1^1/_2$ mm thick, glabrous, without bracts. *Flowers* ca 4—5 cm across (estimated). Pedicel 1.2—1.8 cm, ca 1 mm thick, thickened to ca 2 mm at apex, glabrous, without bracteoles. Sepals 5, oval, ca 12—16 × 10—13 mm, glabrous inside, very shortly hirsute outside, not ciliate at margin. Petals 5, not known from open flowers. Stamens ca 60, slightly curved in bud, all of about same length, ca 10 mm; filament ca 6 mm long, 0.3 mm broad; anther 0.6—1.0 mm broad, broadest in outermost stamens, obtuse at apex; thecae linear-lanceolate, opening with apical pore. Carpels 7—10, usually 8, arranged around rather broad conical receptacle, oblong, ca 5 × 2 mm, glabrous, each with 8—9 ovules; styles spreading, cylindric, ca 7 mm long, at base 0.5, near apex 0.2 mm thick. *Pseudocarps* unknown.

New Guinea: *de Zeeuw 30,* fl. 1942 (MEL); *de Zeeuw,* fl. Apr. 1943 (MEL). — Papua: mainland opposite Samarai (Hydrographers Range), *Lane-Poole 226,* fl. about Aug. 1922 (A, BRI, K, L).

Distribution. Southeast New Guinea.

Vernacular names. *Lalagi* (Buna & Binandele) according to Lane-Poole.

10. Dillenia schlechteri Diels 1922

Dillenia alata var. macrophylla Laut., Bot. Jahrb. 45, 1911, p. 362.

Dillenia macrophylla (Laut.) Diels, Bot. Jahrb. 57, 1922, p. 437.

Dillenia schlechteri Diels, Bot. Jahrb. 57, 1922, p. 438; Hoogl., Fl. Mal. I, 4, 1951, p. 161.

Wormia schlechteri (Diels) Gilg & Werderm. in Engl. & Prantl, Nat. Pfl. Fam. ed. 2, 21, 1925, p. 35.

Wormia macrophylla (Laut.) Gilg & Werderm. in Engl. & Prantl, Nat. Pfl. Fam. ed. 2, 21, 1925, p. 35.

Wormia nitida A. C. Smith, J. Arn. Arb. 22, 1941, p. 499.

Type specimens: *Dillenia alata var. macrophylla:* Peekel 134, Nabumai, Neu Mecklenburg (New Ireland); probably lost. — *Dillenia schlechteri:* Schlechter 18622, Kaiser Wilhelmsland, Bismarckgebirge, 2 Nov. 1908; lectoholotype (isotype) in P. — *Wormia nitida:* Brass 5282, Papua, Mafulu (Centr. Div.), 16 Oct. 1933; holotype in A, isotypes in BRI, BZ, L, NY.

Large evergreen trees, up to 50 m high, 2 m thick, with buttresses to 3 m tall, 1 m long. Bark bright reddish brown, flaky; wood reddish brown, hard and heavy. Branches sympodial, younger ones ca 4 mm thick, sparsely to rather densely hirsute, glabrescent. Leaf-scars amplexicaul, for about $^3/_5$ single line, for $^2/_5$ cordiform with rounded downward directed apex, with 15—25 leaf-traces near lower margin and in central part. *Leaves* ovate to broadly ovate, 11—30 × $7^1/_2$—21 cm, with (13—)15—21 nerves on either side; rounded at apex, rounded, slightly cordate at base, not connected with petiolar wings; margin slightly undulate, nerves rather straight, curving upward near margin, not ending in it; glabrous above, shortly hirsute with rather rigid hairs to glabrous on intervenium, sparsely shortly hirsute to strigose on nerves and midrib, with hairy domatia in axil of nerves beneath. Petiole 4—9 cm, glabrous above, slightly shortly strigose to hirsute beneath, with amplexicaul wings; wings lanceolate to narrowly lanceolate, ca 4—8 mm broad, narrowed towards apex and base, glabrous above, rather densely hirsute beneath, wholly caducous. *Inflorescences* terminal, 2—6-flowered racemes, up to 7 cm long, with nearly straight axis; axis 3—2 mm thick, slightly hirsute to glabrous, without bracts. *Flowers* probably never quite expanding, sepals only slightly diverging in anthesis, petals falling off without spreading. Pedicel $1^1/_2$—4 cm, ca 2 mm thick, thickened to ca $3^1/_2$ mm at apex, sparsely hirsute to glabrous, without bracteoles. Sepals 5, about circular, 2 outermost ones only slightly smaller (ca 22 × 22 mm) than 3 innermost ones (ca 30 × 27 mm), glabrous on both sides, not ciliate at margin. Petals 5, bright yellow, obovate, probably cucullate when falling, ca 33 × 28 mm, rounded at apex, narrowed towards base. Stamens ca 100, slightly curved in bud, all of about same length, 14—17 mm; filament 6—10 mm long, 0.6—1.2 mm broad; anther 0.8—1.3 mm broad, obtuse at apex; thecae deep salmon, linear, opening with apical pore. Carpels 8—11, arranged around conical receptacle, lanceolate, ca 8—9 × 2—$2^1/_2$ mm, glabrous, each with ca 14—18 ovules; styles slightly spreading, 10—12 mm long, cylindric, ca 0.2—0.3 mm thick near base. *Pseudocarps* dehiscent, sepals enlarged to ca 35 × 30 mm; carpels ca 25 × 18 mm, 1-seeded. Seeds obovoid, ca 4 × 3 mm, dark brown, enclosed by $2^1/_2$ mm long, membranous aril.

New Guinea: Papua: Dilava, *White 547*, fl. July—Aug. 1918 (BRI); Mafulu (Centr. Div.), *Brass 5282*, fl. & fr. Oct. 1933 (A, BRI, BZ, L, NY); Boridi, *Carr 13052*, fl. and fr. Sept. 1935 (BM, L, SING); Lala Riv., *Carr 15990*, March 1936 (SING). — Terr. of New Guinea: Bismarck Mts, *Schlechter 18622*, fl. Nov. 1908 (P).

Bismarck Archipelago: New Ireland: Ugana, Zelet Mts, *Peekel 117*, fl. & fr. May 1938 (BZ).

Distribution. E. New Guinea and New Ireland.

Ecology. In New Guinea in forests above 1000 m (1300—1700 m), in New Ireland in primary forest at low altitude.

Vernacular names. *Manaya* (Kuni language, Mafulu); *Muorava* (Dilava).

Uses. According to *Brass 5282* the wood is durable and used for housebuilding.

Notes. 1. Of the two binomials published simultaneously for the species by Diels *D. schlechteri* has been chosen as only for this name a type-specimen is available. *D. macrophylla* is reduced here on account of the specimen from New Ireland, collected later by Peekel not far from the type locality, which specimen in all essential characters agrees with the short original description of *D. alata var. macrophylla* and the later additions by Diels.

2. The species is closely related to *D. papuana* and differs by the absence of the acumen at the apex of the stamen and the straight axis of the inflorescence. From most specimens of *D. papuana* it differs besides by the shape of the petiolar wings, but this character does not seem to be constant in the latter species.

11. Dillenia montana Diels 1922

Dillenia montana Diels, Bot. Jahrb. 57, 1922, p. 437; Hoogl., Fl. Mal. I, 4, 1951, p. 161.

Wormia montana (Diels) Gilg & Werderm. in Engl. & Prantl, Nat. Pfl. Fam. ed. 2, 21, 1925, p. 35.

Type specimen: Ledermann 11037, Sepik region, Hunstein-Spitze, Feb. 1913; probably lost; L. S. Smith NGF 1026, Aiyura, Terr. of New Guinea, Oct. 1944; neo-holotype in L, isotype in LAE.

Evergreen trees, up to ca 35 m high, 40 cm thick, with up to 15 m bole. Bark reddish brown, peeling off in thin papery flakes; heartwood yellowish brown, rapidly getting dark brown. Branches sympodial, younger ones ca 3 mm thick, densely villose, glabrescent. Leaf-scars amplexicaul, for about $^1/_2$—$^2/_3$ single line, for $^1/_2$—$^1/_3$ semi-lunular with ca 11 leaf-traces near lower margin. *Leaves* oval to ovate-elliptic, (7—)11—21 × ($3^1/_2$—)7—$17^1/_2$ cm, with 9—14 nerves on either side; rounded, slightly acuminate at apex, rounded at base, not connected with petiolar wings; margin dentate, nerves rather straight, slightly curving upward near margin, ending in apex of teeth, often 1 or 2 secondary nerves near margin, directed downward, ending in apex of smaller teeth; sparsely villose, soon glabrescent above, more densely villose beneath with dense-hairy domatia in axil of nerves. Petiole $2^1/_2$—7 cm, glabrous above, densely villose, glabrescent beneath, with amplexicaul wings; wings linear-oblong, up to 6 mm broad, apex exceeding insertion to petiole for ca 8 mm, glabrous above, densely villose beneath, wholly caducous. *Inflorescences* terminal, 2-flowered racemes, up to 6 cm long; axis 6—3 mm thick, densely villose, without bracts. *Flowers* incompletely known. Pedicel 8—25 mm, ca 3—4 mm thick, thickened to 5—7 mm at apex, densely villose, without bracteoles. Sepals 5, ovate, 2 outermost ones distinctly shorter (ca 30 × 30 mm) than 3 innermost ones (ca 35 × 30 mm), glabrous inside, 2 outermost ones slightly villose-hirsute, glabrescent, 2 innermost ones glabrous, third on one side glabrous, on other side and central part villose-hirsute, glabrescent outside, innermost ones ciliate at margin where outer side glabrous. Petals 5, yellow, obovate, in bud up to 30 × 17 mm. Stamens ca 90, slightly curved in bud, all of about same length, ca 20 mm; filament ca 9 mm long, flattened, 0.4—0.6 mm broad at apex, 0.6—1.0 mm at base; anther ca 1 mm broad, emarginate at apex with 0.1—0.2 mm deep, obtuse incision; thecae linear, opening with apical pore. Carpels 8—9, arranged around narrow conical receptacle, lanceolate, ca 18 × 4 mm, glabrous, each with 13—14 ovules; styles in lower part parallel, near apex spreading, ca 9 mm long, at base ca 1 mm, at apex 0.3 mm thick, channelled above. *Pseudocarps* unknown.

New Guinea: Terr. of New Guinea: Aiyura area, *L. S. Smith NGF 1026*, fl. Oct. 1944 (L, LAE); Aiyura, Central Highlands, *Womersley NGF 3380*, fl. Nov. 1950 (BZ, L, LAE).

Distribution. NE. New Guinea (Central Highlands and Hunstein Range).

Ecology. Collected at about 1350 and 2000 m altitude.

Vernacular names. *Burra* (Arona), *Warawaka* (Aiyura).

Notes. 1. The identification of the specimens cited with the species as described by Diels is based wholly on the original description, as no type material seems to be existant any longer. The original description of *D. montana,* though incomplete, exactly matches the specimens. The type collection (*Ledermann 11037*) was from the Hunstein Range at 1350 m altitude; the colour of the petals was noted only in this collection. Further the description is wholly based on the actual specimens examined.

2. The species is certainly closely related to *D. schlechteri* and differs from this species by the villose indument and the larger flowers. Unfortunately of both species only very scanty material is available.

12. Dillenia ingens Burtt 1935

Dillenia ingens Burtt, Kew Bull. 1935, p. 299.
Wormia ingens (Burtt) A. C. Smith, J. Arn. Arb. 22, 1941, p. 501.
Type specimen: Waterhouse B 510, Bougainville, Aug. 1931; holotype in K, isotype in A.

Evergreen, few-branched trees, up to 25 m high, 50 cm thick, without buttresses. Bark rufous-brown, peeling off in small thick flakes, leaving a dippled surface. Sapwood straw-coloured, up to 10 cm wide; heartwood reddish brown, moderately hard. Branches sympodial, younger ones 7—8 mm thick, densely villose, glabrescent. Leaf-scars amplexicaul, for about $^{1}/_{5}$ single line, for $^{4}/_{5}$ broadly triangular with rounded, downward directed apex, with ca 40 leaf-traces in lower half, arranged in ca 20 in row parallel to lower margin and ca 20 spreaded above these. *Leaves* elliptic-oblong, 50—100 × 25—50 cm, with 22—30 nerves on either side; rounded to obtuse at apex and base, shortly decurrent, not connected with petiolar wings; margin entire to slightly undulate-dentate, nerves ending in or 1—5 mm from margin, in upper part of leaf bifurcate, upper fork ending in margin, in lower part nerves near margin strongly curved upward with short branch towards margin; dark green with broad pale stripe along centre of midrib, glabrous above, hirsute, most densely so on midrib and nerves beneath. Petiole 3—6 cm, glabrous above, densely hirsute beneath, with amplexicaul wings; wings broadly obovate, 7—8 × 5—6 cm, rounded at apex, with entire to slightly undulate margin, glabrous above, glabrous to densely villose with up to 3 mm long hairs beneath, wholly caducous. *Inflorescences* terminal, 3—6-flowered, up to 12 cm long racemes; axis tortuous, 6—3 mm thick, slightly to densely (especially near base) villose; bracts caducous. *Flowers* incompletely known. Pedicel $^{1}/_{2}$—3 cm, 3—4 mm thick, only slightly thickened at apex, slightly villose, without bracteoles. Sepals 5, obovate, $4^{1}/_{2}$—5 × 4—$4^{1}/_{2}$ cm, glabrous on both sides, not ciliate at margin. Petals unknown. Stamens ca 300, slightly curved in bud, all of about same length, 28—33 mm; filament 18—23 mm long; anthers ca 1.2 mm broad, obtuse at apex; thecae linear, opening with apical pore. Carpels 10, arranged around rather broad sharply conical receptacle, oblong, ca 20 × 5 mm, glabrous, each with ca 20 ovules; styles spreading, cylindric, ca 15 mm long, 0.4—0.3 mm thick, channelled above. *Pseudocarps* dehiscent; sepals enlarged to ca 6 × 5 cm, red; carpels 30 × 16 mm. Seeds unknown.

Solomon Islands: Chiefly New Georgia, *officers of H. M. S. Penguin,* fr. 1894—5 (K); Kugumaru, Buin, Bougainville Isl., *Kajewski 1973,* fr. July 1930 (A, BRI, BZ, G); Siwai, Bougainville Isl., *Waterhouse B 510,* fr. Aug. 1931 (A, K);

Garona, Ysabel Isl., *Brass 3353*, fr. Dec. 1932 (BM, BRI, BZ, G, L); near Keli Riv., Vanganu Isl., New Georgia group, *Walker & White BSIP 146*, fr. Sept. 1945 (A, BRI, K).

Distribution. Solomon Islands.

Ecology. Lowland rain-forest, up to 150 m altitude. Leaves and fruits are eaten by possums; this may be a means of dispersal of the seeds.

Vernacular names. *Aukaba* (Bougainville Isl.); *Nakomo, Randovusukara, Raurau* (Vanganu Isl.).

Notes. 1. It is possible that the petals fall without spreading as e.g. in *D. papuana* and as described on p. 12, as the present species is found in the area, where species with normally spreading corolla have not (yet?) been found.

2. The species is strongly characterized by the large flowers and leaves.

13. Dillenia papuana Martelli 1886

Dillenia papuana Martelli in Becc., Malesia 3, 1886, p. 156; *Hoogl., Fl. Mal. I, 4, 1951, p. 159, fig. 8, 9.

Wormia pteropoda Auct. non Miq.; Boerl., Cat. Bog., 1899, p. 5; Dakkus, Bull. Jard. Bot. Btzg Suppl. 1, 1930, p. 296.

Dillenia calothyrsa Diels, Bot. Jahrb. 57, 1922, p. 437.

Wormia calothyrsa (Diels) Gilg & Werderm. in Engl. & Prantl, Nat. Pfl. Fam. ed. 2, 21, 1925, p. 35.

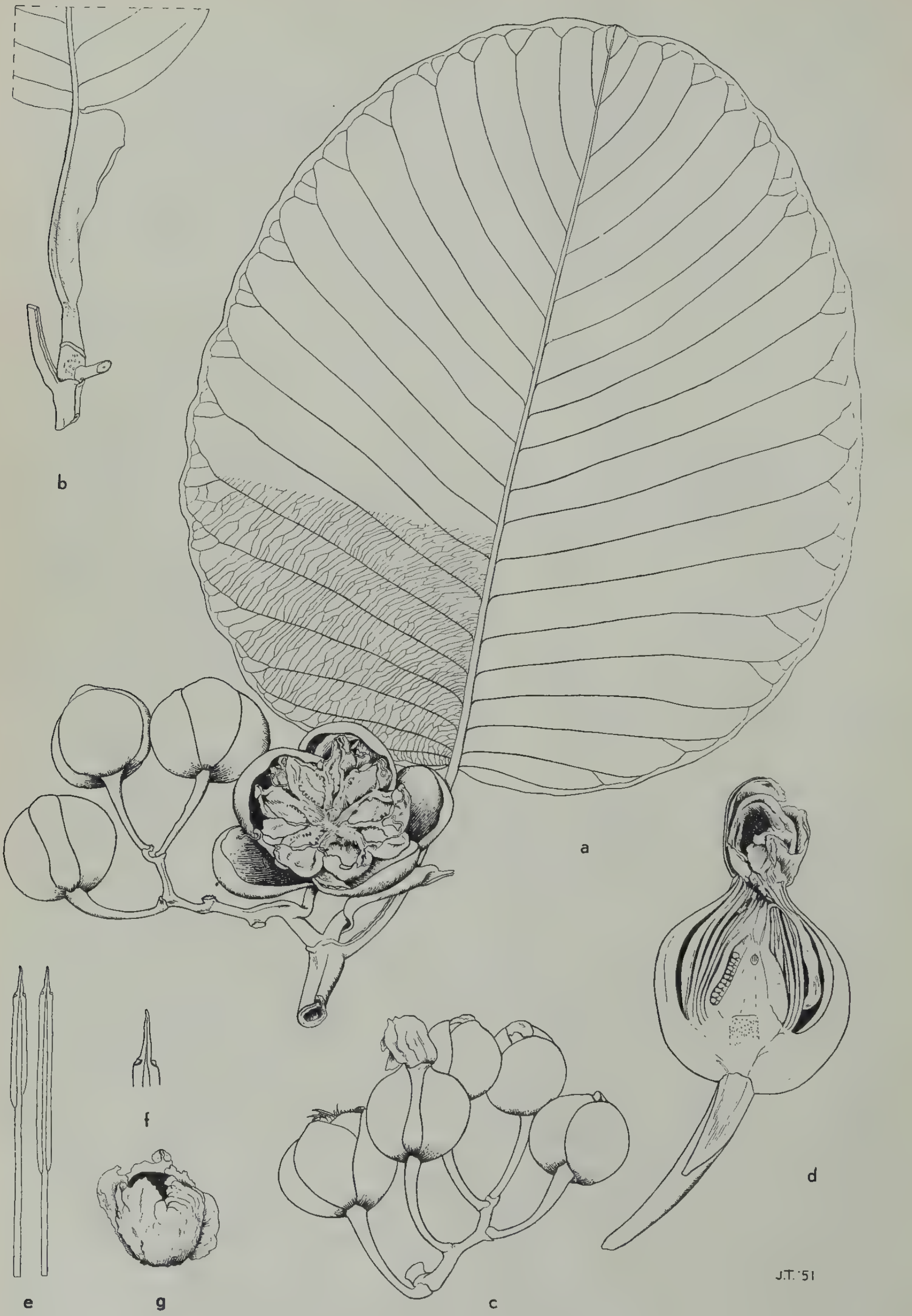
Wormia papuana (Martelli) Gilg & Werderm. in Engl. & Prantl, Nat. Pfl. Fam. ed. 2, 21, 1925, p. 35.

Wormia macrophylla Auct. non (Laut.) Gilg & Werderm.; A. C. Smith, J. Arn. Arb. 22, 1941, p. 498.

Type specimens: *Dillenia papuana:* Beccari PP 647, Andai, 1872; holotype in FI, isotype in A. — *Dillenia calothyrsa:* Ledermann 10557, Hauptlager Malu, Sepik-Gebiet, Jan. 1913; probably lost.

Fig. 4, p. 40.

Evergreen trees, up to ca 30 m high, 1 m thick, with up to 20 m bole, without or with buttresses. Bark pale reddish brown, peeling off in very thin papery flakes. Branches sympodial, younger ones 5—8 mm thick, sparsely hirsute, glabrescent. Leaf-scars amplexicaul, for about $^1/_2$—$^2/_3$ rather broad single line, with on leaf-opposed side V-shaped downward bend, 3—8 mm deep, for $^1/_2$—$^1/_3$ triangular with rounded, downward directed apex and slightly emarginate upper margin, with ca 25 leaf-traces spread over scar except 1—1$^1/_2$ mm broad marginal part. *Leaves* elliptic to ovate, rarely nearly circular, (12—)25—40 × (7$^1/_2$—)15—35 cm, with (13—)20—25(—30) nerves on either side, on saplings and young trees narrower and larger, ca 50—100 × 25—50 cm, with ca 30—35 nerves on either side; rounded to obtuse at apex, rounded at base, sharply separated from petiolar wings; margin undulate to slightly dentate, nerves and often 1—3 secondary nerves directed downward from nerves near margin ending in apex of teeth or when margin undulate 1—3 mm from margin; glabrous to sparsely shortly hirsute with 0.2—0.8 mm long hairs on intervenium, glabrous to slightly villose on nerves and midrib above, glabrous to shortly hirsute on intervenium, sparsely to rather densely shortly hirsute on nerves, often with small hairy domatia in axil of nerves beneath, densely shortly ciliate at margin, glabrescent on older leaves. Petiole 4—8 cm, on saplings and young trees up to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10 cm, with amplexicaul wings; wings half-obcordiform, 6—10 mm broad at base, up to 35 mm near apex, rarely oblong to lanceolate, 5—10 mm broad, glabrous above, sparsely hirsute to villose beneath, wholly caducous. *Inflorescences* terminal, 4—7-flowered racemes, up to 8 cm long, with tortuous axis; axis red, glabrous, 4—2 mm thick, without bracts. *Flowers* probably never quite expanding, sepals only slightly diverging in anthesis, petals falling off without spreading. Pedicel $2^1/_2$—4 cm, $1^1/_2$—3 mm thick, thickened at apex up to 6 mm, glabrous, without bracteoles. Sepals 5, circular to oval, ca 30—40 × 25—40 mm, glabrous on both sides, ciliate at margin. Petals 5, yellow, obovate, cucullate when falling, ca 25—45 × 12—25 mm, rounded at apex, narrowed towards base. Stamens ca 185—250, slightly curved in bud, all of about same length, 13—24 mm long; filament yellow, 6—15 mm long, 0.5—1.4 mm broad; anther ca 0.8—1.2 mm broad, at apex with 1—2 mm long, at base 0.3—0.5 mm broad acumen; thecae red, linear, opening with apical pore. Carpels 10—15, arranged around narrow conical receptacle, lanceolate, ca 10—15 × 2—3 mm, glabrous, each with ca 25 ovules; styles slightly spreading, 11—15 mm long, cylindric, 0.4—0.7 mm thick at base, channelled above. *Pseudocarps* dehiscent; carpels 25—35 × 16—24 mm, each with 0—1 seeds. Seeds obovoid, ca 6 × 5 mm, black, enclosed by rather thick fleshy aril.

Lesser Sunda Islands: Tanimbar Isls: P. Jamdena, between Ilgnei & Otimmer, *Buwalda 4291 = NIFS bb 24305*, fr. March 1938 (A, BZ, L, SING).

New Guinea: Dutch W. New Guinea (Vogelkop): Andai, *Beccari PP 647*, fl. & fr. Aug. 1872 (A, FI); Kofo Anggi (Arfak), *Mayr 239*, fl. June 1928 (BZ); Babo, *NIFS bb 22293*, March 1937 (A, BZ, L); Manokwari, Ransiki, Warsuwi, *NIFS bb 33318*, fl. July 1948 (BZ, K, L); Manokwari, dessa Momir, *NIFS bb 33464*, Aug. 1948 (L); ibidem, *NIFS bb 33541*, fl. Sept. 1948 (BZ, L). — Dutch N. New Guinea: Meervlakte, *Feuilletau de Bruyn 200*, fl. Sept. 1914 (BZ, L); Meervlakte, Motor Bivak, Rouffaer Riv., *Docters van Leeuwen 11079*, fr. Nov. 1926 (BZ, L); near Prauwen Bivak, *Lam 1003*, fl. Sept. 1929 (BZ, K, L, U); Hollandia, Bernhard Bivak, *NIFS bb 25653*, fl. July 1938 (A, BZ, L, SING); Bernhard Camp, Idenburgh Riv., *Brass 14114*, fl. Apr. 1939 (A, L). — Dutch S. New Guinea: Lorentz Riv., *NIFS bb 22124*, Jan. 1937 (BZ); Mimika, Aëndua (Uta), *NIFS bb 32918*, July 1941 (BZ, L). — Terr. of New Guinea: Lae, Morobe Distr., *Ingram NGF 960*, fl. (L); ibidem, *NGF 3286* (L); Sepik Riv. above Frieda Riv., *Womersley NGF 3760*, Sept. 1949 (L); Sepik Riv. near Yellow Riv., *Womersley NGF 3926*, fl. Oct. 1949 (L). — Schouten Isls: Biak Isl., *NIFS bb 30755*, Sept. 1939 (BZ, L). — Japen Isl.: S. Memperawaja near Serui, *Aet & Idjan 804*, fl. Sept. 1939 (BZ, L). — Aru Isls: Giabu-lengan, *Beccari*, May 1873 (FI); P. Wamar, Galgamona, Durdjela, *NIFS bb 15054*, Feb. 1931 (BZ, L); Dasinamalau, P. Watubakar, *NIFS bb 25300*, May 1938 (A, BZ, L).

Cultivated: Cult. Hort. Bog. no IV. G. 11 from Aru Isls (BZ); Buitenzorg, cultivated on native premises, *Bakhuizen van den Brink 8203*, Apr. 1940, young tree (BZ, L, SING).

Distribution. Lesser Sunda Islands (Tanimbar Islands only), New Guinea, and adjacent islands (some of the islands in the Geelvink Bay and Aru Islands).

Fig. 4 — *Dillenia papuana* Martelli (p. 39); a. fruiting branch with one fullgrown leaf, infrutescence, and terminal bud, × $^2/_5$; b. leafbase and petiole with amplexicaul petiolar wings, from young leaf, × $^2/_5$; c. inflorescence, the first flower with the corolla already fallen off, the second with the corolla partly protruding, × $^2/_5$; d. longitudinal section through the flower shortly before the corolla falls, slightly reduced; e. stamens, × 2; f. apex of the stamen, × 4; g. arillate seed, × 2; all after specimens from cultivation in the Botanic Garden, Bogor (IV. G. 11a).

Ecology. In primary forests, often in temporarily flooded, but also in permanently dry situations, generally at low altitude, once collected at ca 2000 m altitude (*Mayr 239*). A photograph of the most typical habitat has been published in Flora Malesiana I, 4, 1951, p. 160, f. 9.

Vernacular names. Tanimbar Isls: *Kamjemeje.* New Guinea: *Airabumarai* (Papuan, Modan; Babo), *Jaô* (Tarie language; Aenduna), *Kiep* (Atam language; Manokwari), *Majonga* (Manikiong language; Manokwari), *Mekawir* (Papuan, Manowee; Lorentz River). Schouten Isls: *Asur* (Bosniek; Biak Isl.). Aru Isls: *Kaigabar* (Arunese; P. Wamar), *Kumera* (Arunese, P. Watubakar), *Merah perempuan* (Malay, P. Wamar).

Notes. 1. The size of the flowers is very variable, as can be seen in the description in the wide range covered by the dimensions of the floral parts. A large-flowered specimen is e. g. the tree in the Botanic Garden at Bogor or *NIFS bb 33318,* a small-flowered one *Aet & Idjan 804*; several collections are intermediate as to this character.

2. In most specimens the petiolar wings are half-obcordiform, in some they are narrower and then oblong to lanceolate, e. g. in *Aet & Idjan 804* and *NIFS bb 22124.* I could not find a constant additional character in other parts.

14. Dillenia crenata (A. C. Smith 1941) Hoogl. comb. nov.

Wormia crenata A. C. Smith, J. Arn. Arb. 22, 1941, p. 498.

Type specimen: Brass 3418, Tatamba, Ysabel Isl., Solomon Isls, 4 Jan. 1933; holotype in A, isotypes in BRI, BZ, G, L, SING.

Large evergreen trees, up to ca 30 m high, with straight bole with buttresses and spreading branches. Bark pale to reddish brown, peeling off in thin flakes. Wood yellowish or brown. Branches sympodial, younger ones ca $2^1/_2$—4 mm thick, glabrous to rather densely shortly villose-strigose, glabrescent. Leaf-scars amplexicaul, for about $^2/_3$ single line, for $^1/_3$ highly triangular with rounded downward directed apex, with ca 15—19 leaf-traces spreaded in lower half. *Leaves* oval to ovate, (6—)10—18(—22) × ($4^1/_2$—)8—15(—18) cm, with (6—)9—14 nerves on either side; rounded with ca $^1/_2$ mm long broad acumen at apex, rounded at base, decurrent, not connected with petiolar wings; margin undulate to dentate, most so in apical part of leaf, nerves rather straight, curving upward near margin, not ending in it, with small vein ending in apex of teeth, often with 1(—3) rather strong secondary nerves ending in apex of smaller teeth; glabrous on both sides. Petiole $3^1/_2$—$7^1/_2$ cm, glabrous, with amplexicaul wings; wings linear-lanceolate, 4—9 mm broad, rounded at apex, apex exceeding insertion to petiole for 2—8 mm, wholly caducous. *Inflorescences* terminal, later lateral, leaf-opposed, 2(—3)-flowered racemes, up to ca 6 cm long; axis ca 4—2 mm thick, glabrous to densely shortly hirsute with yellow to dark-orange hairs, without bracts or apical flower sometimes enclosed by caducous bract; bract conduplicate, up to ca 20 mm long, 2 × 10—12 mm broad, glabrous above, sparsely shortly strigose, locally densely shortly hirsute with deep-orange hairs beneath. *Flowers* probably never quite expanding, sepals only slightly diverging in anthesis, petals falling off without spreading. Pedicel of lower 1(—2) flowers ca 5—10 mm, of upper flower 0—6 mm, ca 2—3 mm thick, thickened to ca 5 mm at apex, densely hirsute with orange hairs, without bracteoles. Sepals 5, 2 outermost ones transverse-oval, ca 20 × 25 mm, 3 innermost ones about circular, ca 20 mm diam., densely shortly hirsute, most densely so on centre of 2 outermost ones, with yellowish to deep red hairs outside, ciliate at margin. Petals 5, yellow or white, obovate, cucullate when falling, ca 4 × 2 mm, rounded at apex, narrowed towards base. Stamens ca 140, slightly curved in bud, all of about same length, ca 12—15 mm; filament 7—10 mm long, 0.5—0.8 mm broad; anther ca 1.0 mm broad, obtuse to truncate at apex; thecae linear, opening with apical pore. Carpels 6—8, arranged around conical receptacle, ovate, ca 6 × $2^1/_2$ mm, glabrous, each with ca 12 ovules; styles about parallel, ca 12 mm long, ca 0.5 mm thick at base, 0.1 mm near apex. *Pseudocarps* dehiscent, sepals enlarged to ca 30 × 20 mm; carpels ca 20 × 16 mm, each with 0—1 seeds. Seeds obovoid, ca 5 × $3^1/_2$ mm, dark brown, enclosed by membranous aril.

Solomon Islands: Baela, Florida, *Comins 291*, fr. (K); Ysabel Isl., *le Guillou (Voyage de l'Astrolabe et de la Zélée)*, fl. 1841 (P); Ulawa, *Brass 2957*, fr. Oct. 1932 (A, BRI, BZ, L); Ysabel Isl., Kakatio, *Brass 3242*, fl. Dec. 1932 (A, BM, BRI, BZ, L); Ysabel Isl., Tatamba, *Brass 3418*, fl. Jan. 1933 (A, BRI, BZ, G, L, SING).

Distribution. Solomon Islands.

Ecology. Rain-forest, from 50 to 900 m altitude.

Vernacular names. *Kepe* (Ysabel Isl.).

Notes. 1. The colour of the indument of the axis of the inflorescences, of the pedicels, and of the outer side of the sepals in dried specimens is yellowish to deep orange; if wet it turns to magenta. On field-labels yellow as well as orange and red have been noted.

2. According to *Comins 291* (information from natives) the fruit never ripens and the species can only be propagated by cuttings. According to *Brass 2957* the lower part of the trunk often gives rise to numerous erect coppice shoots.

15. Dillenia salomonensis (White 1950) Hoogl. comb. nov.

Wormia salomonensis C. T. White, J. Arn. Arb. 31, 1950, p. 98.

Type specimen: Walker & White BSIP 145a, New Georgia, near Munda, 3 Oct. 1945; holotype in BRI, isotypes in A, K, L.

Evergreen trees, ca 36 m high, 70 cm thick, with plank-like buttresses. Bark rufous-brown, peeling off in small thick flakes leaving a dippled surface. Sapwood yellowish to pinkish brown, ca 5 mm thick; heartwood reddish brown. Branches sympodial, younger ones ca 3—4 mm thick, sparsely shortly sericeous, glabrescent. Leaf-scars amplexicaul, for about $^3/_5$ single line, for $^2/_5$ semi-lunular with ca 13 leaf-traces partly near lower margin, a few above these. *Leaves* subcoriaceous, oblong 9—25 × $3^1/_2$—11 cm, with 9—14 nerves on either side; obtuse to acute at apex and base, base for 1—$1^1/_2$ mm connected with petiolar wings; margin slightly undulate, nerves rather straight, curving upward near margin, not ending in it; glabrous above, very sparsely shortly sericeous, very soon glabrescent beneath. Petiole 3—7 cm, glabrous above, sericeous like blade beneath, with amplexicaul wings; wings linear-lanceolate, 2—4 mm broad, glabrous above, sericeous like petiole beneath, upper part (about $^2/_3$—$^3/_4$) persistent, lower part caducous, transition between these parts rather sudden; petiole at insertion with horseshoe-shaped cushion. *Inflorescences* terminal, 3—5-flowered racemes, up to ca 3 cm long, first flower attached immediately at foot; axis ca $1^1/_2$—2 mm thick, sericeous at foot like younger branches, higher up glabrous, without bracts. *Flowers* probably never quite expanding, sepals only slightly diverging in anthesis, petals falling off without spreading. Pedicel $1^1/_2$—$2^1/_2$ cm, ca 1—$1^1/_2$ mm thick, thickened to 2 mm at apex, sericeous at foot like axis of inflorescence in basal flower, glabrous in others, without bracteoles. Sepals 5, 2 outermost ones slightly smaller (ca 15 × 10 mm) than 3 innermost ones (ca 20 × 14 mm); glabrous inside, very sparsely shortly sericeous outside, outermost ones red, innermost ones yellow in upper, red in lower part. Petals 5, deep cream coloured, obovate, cucullate when falling, ca 3 × $1^1/_2$ cm, rounded at apex, narrowed towards base. Stamens ca 65, slightly curved in bud, all of about same length, ca 25 mm; filament ca 15 mm long, ca 0.5 mm broad at base, 0.3 mm from 5 mm upward; anther ca 0.8 mm broad, acute at apex; thecae linear, opening with apical pore. Carpels 5, arranged around narrow cuneate receptacle, lanceolate ca 7 × 2 mm, densely shortly hirsute with ca 0.2 mm long hairs outside, near cuneate part of receptacle with up to 0.6 mm long, more rigid hairs, each with ca 12 ovules; inner side of wall of carpels and basal part of stylar canal densely hirsute with ca 0.5 mm long hairs; styles only very slightly diverging, ca 10 mm long, channelled, hirsute on lower 3 mm above, further glabrous. *Pseudocarps* unknown.

Solomon Islands: New Georgia, Vanganu Isl., near Keli Riv., *Walker & White BSIP 145*, Sept. 1945 (A, BRI, K); New Georgia, near Munda, *Walker & White BSIP 145a*, fl. Oct. 1945 (A, BRI, K, L).

Distribution. Solomon Islands.

Ecology. Common in lowland rain-forest.

Vernacular names. *Mundo* (M.); *Kapuchu* (Mar.); *Sembere* (Rend.).

Uses. A moderately hard and moderately heavy timber, suitable for interior finishing and slice-cut veneers.

16. Dillenia insignis (A. C. Smith 1941) Hoogl. comb. nov.

Wormia insignis A. C. Smith, J. Arn. Arb. 22, 1941, p. 500.

Type specimen: Kajewski 1740, Kupei Gold Field, Bougainville, 18 Apr. 1930; holotype in A, isotypes in BRI, BZ, C, G, L, P, S, SING.

Evergreen trees, up to 30 m high. Branches sympodial, younger ones ca $1^1/_2$—$2^1/_2$ mm thick, glabrous to sparsely hirsute with $^1/_2$ mm long hairs, particularly from axil of leaves upward, glabrescent, leaf-bearing parts smooth, very dark brown in dried specimens, older parts with faint longitudinal fissures. Leaf-scars amplexicaul, for about $^3/_4$ single line, for $^1/_4$ broadly subfalcate with ca 7 leaf-traces in lower part. *Leaves* longly petiolate, oval. ($4^1/_2$—)6—9(—10) × ($3^1/_2$—)$4^1/_2$—6(—$6^1/_2$) cm, with (5—)7—8 nerves on either side; rounded to obtuse at apex, rounded at base, for $1^1/_2$—2 mm connected with petiolar wings; margin entire to slightly undulate, with nerves distinctly curving upward and ending close to margin; shining above, slightly less so beneath, glabrous on both sides. Petiole 3—6 cm, glabrous, with amplexicaul wings; wings oblanceolate, 5—9 mm broad, narrowing near base of blade to $1^{1}/_{2}$—2 mm, rounded at apex, partly caducous, permanent part at base of petiole $1^{1}/_{2}$—2 mm broad, above about $^{1}/_{3}$ of length of petiole wings wholly persistent, separation between both parts rather sharp; petiole bearing at attachment, most conspicuously in older leaves, horseshoe-shaped cushion. *Inflorescences* terminal, 2-flowered, flowers on ca 5 mm long common axis; axis 3—2 mm thick, hirsute, without bracts. *Flowers* probably never quite expanding, sepals only slightly diverging in anthesis, petals falling off without spreading. Pedicel 4—5 cm, $1^{1}/_{2}$—2 mm thick, thickened to $2^{1}/_{2}$—3 mm at apex, hirsute, one without bracteoles, one with 2 caducous bracteoles. Sepals 5, in open flower forming cup-shaped calyx, broadly circular to oval, 2 outermost ones ca 24 × 22 mm, 3 innermost ones ca 30 × 25 mm, glabrous inside, rather densely shortly sericeous with slightly distant hairs outside, ciliate at margin. Petals 5, apricot to dark pink, obovate, 40—45 × 30—32 mm, cucullate when falling, rounded at apex, narrowed towards base. Stamens ca 95, light brown, slightly curved in bud, all of about same length, 25—28 mm; filament linear, 17—20 mm long, 0.8—1.0 mm broad; anther ca 1.0 mm broad, obtuse at apex; thecae linear, 8—10 mm long, opening with apical pore. Carpels 8—10, arranged around conical receptacle, distinctly coherent with each other in lower adaxial part, lanceolate, ca 12 × 5 mm, densely silky hairy with $^{1}/_{2}$—1 mm long rigid hairs, each with ca 20 ovules; styles slightly diverging, light green, cylindric, 12—15 mm long, ca $^{1}/_{2}$ mm thick, channelled above. *Pseudocarps* unknown.

Solomon Islands: Kupei Gold Field, Bougainville Isl., *Kajewski 1740,* fl. Apr. 1930 (A, BRI, BZ, C, G, L, P, S, SING).

Distribution. Solomon Islands.

Ecology. Rain-forest at 1000 m altitude.

17. Dillenia biflora (A. Gray 1854) Martelli ex Dur. & Jacks. 1902

Capellia biflora *A. Gray, Bot. U. S. Expl. Exped. 1, 1854, p. 15, t. 1.

Capellia membranifolia A. Gray, Bot. U. S. Expl. Exped. 1, 1854, p. 15.

Wormia biflora (A. Gray) Seem., Fl. Vit., 1865, p. 3.

Wormia membranifolia (A. Gray) Seem., Fl. Vit., 1865, p. 4.

Dillenia biflora (A. Gray) Martelli ex Dur. & Jacks., Ind. Kew. Suppl. 1, 1902, p. 136; Guill., J. Arn. Arb. 12, 1931, p. 222; Guill., Ann. Mus. Col. Mars. 6me Série, 5/6, 1948, p. 36.

Dillenia membranifolia (A. Gray) Martelli ex Dur. & Jacks., Ind. Kew. Suppl. 1, 1902, p. 136.

Dillenia neoebudica Guill., J. Arn. Arb. 12, 1931, p. 222; Guill., Ann. Mus. Col. Mars. 6me Série, 5/6, 1948, p. 36.

Type specimens: *Capellia biflora:* U. S. S. Pac. Expl. Exped. 1838—42, Feejee Isls, Ovalau; holotype in GH, isotypes in P, US. — *Capellia membranifolia:* U. S. S. Pac. Expl. Exped. 1838—42, Feejee Isls, Ovalau; holotype in GH, isotypes in NY, US. — *Dillenia neoebudica:* Kajewski 323, Dillona Bay, Erromanga, New Hebrides, 29 May 1928; lectoholotype in P, isotypes in A, BRI, K, NY.

Evergreen trees or large shrubs, up to ca 15, usually up to ca 7 m high with spreading branches. Branches sympodial, younger ones ca 3—5 mm thick, glabrous to rather densely strigose or densely strigose-hirsute, glabrescent. Leaf-scars amplexicaul, for about $^1/_2$ single line, for $^1/_2$ semi-lunular with ca 15 leaf-traces slightly below middle. *Leaves* ovate to elliptic-oblong, rarely obovate, (13—)18—40(—50) × (6—)9—18(—25) cm, with 13—17(—23) nerves on either side; acute to rounded at apex, obtuse at base, decurring into petiolar wings; margin dentate to nearly entire, nerves straight, ending in apex of teeth, often with 1—2 downward directed rather strong secondary nerves near margin, ending in apex of smaller teeth; glabrous to sparsely shortly hirsute above, glabrous to rather densely shortly hirsute beneath. Petiole ca 2—8 cm, with amplexicaul wings; wings not sharply separated from blade, 5—15(—25) mm broad, nervation of blade continuing, but less marked on wings, wings and part of blade below line where both sides cohere in young leaf of different (in dried specimens darker) colour; wings glabrous above, glabrous to rather densely shortly hirsute beneath, caducous on rather old leaves, loosening along petiole upward and from base of blade along transverse, rather irregular line, indicated already before loosening by slightly thickened wall. *Inflorescences* terminal, later lateral, leaf-opposed, 2(—6)-flowered racemes, up to ca 10 cm long; axis ca 1—2 mm thick, glabrous to rather densely strigose-hirsute, glabrescent, without or with (not in first flower) bracts; bracts caducous, sessile, lanceolate, up to ca 25 × 8 mm. *Flowers* probably never quite expanding, sepals only slightly diverging in anthesis, petals falling off without spreading. Pedicel 5—20 mm, $2^1/_2$—3 mm thick, thickened to 5 mm at apex, glabrous to rather densely strigose-hirsute, glabrescent, without bracteoles. Sepals 5, 2 outermost ones transverse-oval, ca 25 × 30 mm, 3 innermost ones oval, ca 30 × 25 mm, glabrous inside, glabrous to rather densely villose-hirsute outside, slightly ciliate at margin. Petals 5, yellow or white, obovate, cucullate when falling, ca 4—5 × 2—$2^1/_2$ cm, rounded at apex, narrowed towards base. Staminodes, on outer side of androecium, ca 300 (estimated), linear-filamentous, thin, ca 10—15 mm long, 0.1—0.2 mm broad, coherent with each other. Stamens ca 200, innermost ones ca 20 mm, outermost ones ca 17 mm long, all with apical part (ca 3 mm) irregularly curved in bud and flower; filament ca 15—17 mm long, ca 0.3—0.5 mm broad, up to 0.8 mm at base in innermost stamens; anther up to ca 4 mm long, ca 1.0 mm broad, slightly emarginate at apex, in outermost stamens ca 0.7 mm long, sometimes with only single theca; thecae linear, opening with apical pore. Carpels 5—10, usually ca 8, arranged around very broad, low-conical receptacle, conical part ca $^1/_3$ as high as length of carpels; carpels ovate, ca 5 × $2^1/_2$ mm, glabrous, each with 12—15 ovules; styles about parallel to slightly divergent in open flower, spreading in bud, ca 12—15 mm long, ca $1^1/_2$ mm thick at base, 0.2 mm near apex. *Pseudocarps* unknown to me.

New Hebrides: Lenakel, Tanna, *Kajewski 132*, fl. March 1928 (A, K, NY, P); Dillona Bay, Erromanga, *Kajewski 323*, fl. May 1928 (A, BRI, K, NY, P); West coast, Aneityum Isl., *Wilson 965*, fl. Sept. 1929 (A, BRI, BZ, K, NY, P); Hog Harbour, *Baker 286*, fl. Jan. 1934 (BM).

Fiji Islands: *Seemann 2*, fl. July 1860 (BM, K, MEL, P); *Horne*, 1877—8 (K); *Williams* (K); *Jeoward 89*, fl. Oct. 1894 (K). — Vanua Levu: Lambasa, *Greenwood 521*, fl. Sept. 1922 (K); Upper Ndama Riv. Vall., *A. C. Smith 1696*, fl. Apr. 1934 (BZ, GH, K, NY, S, UC); Wainikoro (N. side), *Greenwood 596*, fl. Jan. 1935 (K); Savathuru Mtn near Valethi, *Degener & Ordonez 13839*, fr. Dec. 1940 (A, K, NY). —

Viti Levu: near Suva, *Sykes 71*, fr. Dec. (IFI); Korukelevu, *Parks 10291*, fl. (UC); Korumbamba, *Parks 20095*, fl. May 1927 (UC); Tamavua woods near Suva, *Gillespie 2182*, fl. Aug. 1927 (GH, K, NY, UC); Naitasiri Prov., near Nasinu, *Gillespie 3529*, fl. Oct. 1927 (UC); Waidoi, *Nielsen 224*, fl. Jan. 1928 (C); Nandarivatu, *Tothill 2*, fl. 1929 (K); Suva, *Tothill 41*, 1929 (K); Naitasiri Prov., near Colo, *Parham 100*, fl. Oct. 1932 (BM); Tholo North, Sovutawambu near Nandarivatu, *Degener 14654*, fl. March 1941 (A); Rewasa near Vaileka, *Degener 15523*, fl. May—June 1941 (A, NY); Naitasari Prov., near Nasinu, *Greenwood 1120*, fl. June 1945 (A). — Ovalau: *U. S. S. Pac. Expl. Exped.*, fl. 1838—42 (GH, P, US); *idem*, veg. (GH, NY, US); Levuka, *Parks 20497*, fl. June 1927 (UC).

Distribution. New Hebrides (only known from the southern islands) and Fiji Islands.

Ecology. In the New Hebrides the species was collected in rain-forest at low altitude (up to 400 m), in the Fiji Islands in wet shrubby pasture, in mangrove swamp, in forest, and in moist ravines, from sea-level up to 800 m altitude. A distinct periodicity in flowering is not indicated by the available data.

Vernacular names. New Hebrides: *Net hul* (Erromanga); *Nejul* (Aneityum); *Ta voni* (Hog Harbour). Fiji Isls: *Kulukulu* (Vanua Levu); *Kukulava, Kukulova, Kukuluva, Ta voli* (Viti Levu).

Uses. "Bark used by natives by maceration with water for medicine of mother of new-born child" (*Kajewski 323*).

Notes. 1. The specimens from the New Hebrides differ from those from the Fiji Islands by having relatively longer petioles with narrower wings; I could not find any difference in the flowers. To my idea, therefore, the distinction of two species, as has been proposed by Guillaumin, is not justified.

2. I am not sure about the colour of the petals. From the New Hebrides as well as from the Fiji Islands both yellow and white have been indicated on the field labels. The present species is the only one in the genus in which both colours are found.

3. Though distinctly different, the structure of the androecium strongly reminds to that found in *D. ferruginea* from the Seychelle Islands. It is remarkable, that these types are found at respectively the easternmost limit of the area of the genus and near the westernmost limit. On the other hand the present species in the structure of the corolla shows affinity to some species from New Guinea and the Solomon Islands, which have a different type of androecium.

18. Dillenia ferruginea (Baill. 1865—6) Gilg 1893.

Wormia ferruginea Baill., Adansonia 6, 1865—6, p. 268; Baill., Adansonia 7, 1866—7, p. 434; *Wright, Trans. Roy. Ir. Acad. 24, 1871, p. 573, t. 27; Baker, Fl. Maur. & Seych., 1877, p. 2; *Diels, Wiss. Ergebn. Deut. Tiefsee-Exped. Valdivia 1898—99, 2, 1, 1922, p. 448, f. 24.

Dillenia ferruginea (Baill.) Gilg in Engl. & Prantl, Nat. Pfl. Fam. 3, 6, 1893, p. 125.

Neowormia ferruginea (Baill.) Hutch. & Summerh., Kew Bull. 1928, p. 388.

Type specimen: Boivin, Mahé, Seychelle Islands, lectoholotype in P.

Fig. 5, p. 48.

Evergreen trees. Branches sympodial, younger ones ca 4 mm thick, densely ferrugineously hirsute with up to 5 mm long hairs, glabrescent, on young trees and saplings glabrous. Leaf-scars amplexicaul, for about $^1/_2$ single line, for $^1/_2$ highly triangular with ca 13 leaf-traces near lower margin. *Leaves* elliptic-oblong, ca 20—40 × 11—20 cm, with (35—)40—46 (—52) nerves on either side; rounded to obtuse at apex, rounded, slightly cordate at base, not connected with petiolar wings; margin slightly undulate. nerves rather straight, slightly curving upward near margin, ending in margin; densely shortly tomentose. glabrescent above, densely shortly tomentose on intervenium, densely hirsute with up to ca 5 mm long hairs on midrib and nerves beneath. Petiole $3^1/_2$—10 cm, densely shortly tomentose above, densely hirsute like midrib beneath, conduplicate, with amplexicaul wings; wings linear-lanceolate, at base up to 7 mm broad, at apex ca 1 mm broad, densely shortly tomentose above, densely hirsute beneath. On saplings and young trees blade and winged petiole not sharply separated, leaves up to 65-nerved, up to 90 × 25 cm, obtuse to acute at apex, with undulate margin in upper part, dentate in lower part, in young leaf with spinish teeth, glabrous above, very sparsely shortly strigose beneath, deep red coloured. *Inflorescences* terminal, later lateral, leaf-opposed, up to 25 cm long racemes, up to 18-flowered, lower flowers fallen off on older inflorescences, of each inflorescence only 1 or 2 flowers ripening to fruits; axis 1—2 mm thick, densely hirsute like younger branches, first internode up to 9 cm long; bracts caducous, ovate, ca 10 × $7^1/_2$ mm, densely short-tomentose above, densely hirsute beneath. *Flowers* ca 5 cm across. Pedicel ca 1—2 cm, $1^1/_2$—2 mm thick, thickened to 4—

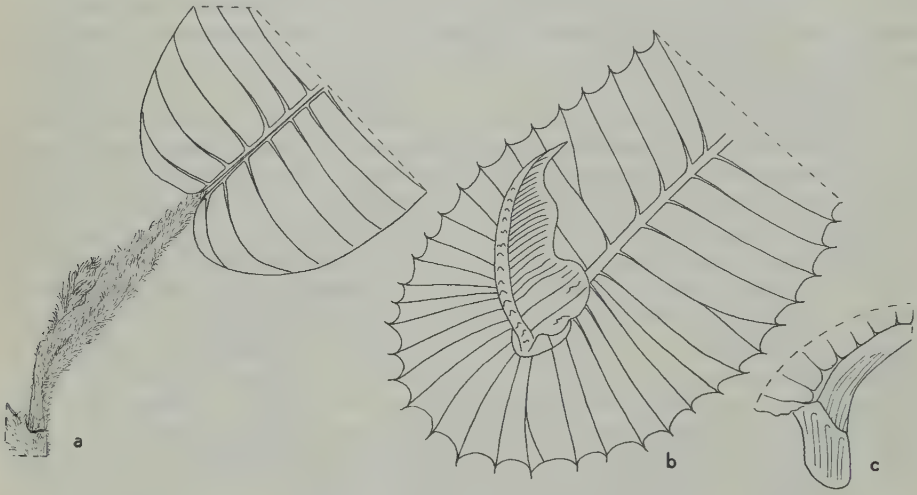

Fig. 5 — *Dillenia ferruginea* (Baill.) Gilg (p. 47); a. leafbase and petiole with amplexicaul wings, just opening and showing the apical shoot, from an older branch, usually bearing inflorescences (actual size of the blade 35 × 20 cm, of the petiole 8 cm); b. leafbase from a young tree, with a very young leaf at the apex of the shoot (actual size of the blade 80 × 25 cm); c. same as b, seen from below; all × ½, based on sketches made after nature by J. N. Milsum, F. L. S..

5 mm at apex, densely hirsute like axis of inflorescence, without bracteoles. Sepals ca 8—11, 2 outermost ones circular to transverse-oval, ca 10 × 10—13 mm, glabrous inside, densely ferrugineously hirsute with 0.3—3 mm long hairs outside, hairs on central part generally longer than those on marginal parts, 6—9 innermost ones oval, 15—17 × 12—14 mm, glabrous inside, densely ferrugineously hirsute with hairs more appressed than in outermost sepals, with 2—3 mm broad glabrous margins outside, all ciliate at margin. Petals 5, whitish, obovate, ca 2 × $1^1/_2$ cm, rounded at apex, narrowed towards base. Stamens and staminodes together ca 450—490, staminodes on outer side, outermost ones ca 0.8 mm long, wholly sterile, gradually longer towards centre of flower with no sharp distinction between staminodes and stamens, innermost stamens ca 4.0 mm long; filament 1.4—2.0 mm long, ca 0.3 mm broad; anther ca 0.6 mm broad, slightly emarginate at apex; thecae linear-oblong, opening with longitudinal, lateral slit, with undulate margin. Carpels (6—)8(—10), arranged around very broad shortly conical receptacle, elliptic, ca 5 × $2^1/_2$ mm, glabrous, each with ca 10—18 ovules; styles spreading, ca 5 mm long, flattened, ca 0.5 mm broad, channelled above. *Pseudocarps* unknown to me.

Seychelle Islands: fl. (P); *Blackburn,* fl. (K); Mahé, *Boivin,* fl. & sapling (P); behind the Trois Frères Mts, *Bouton,* fl. (K); *Pervillé & Wright* (P); *Wright,* fl. (BM); *Pervillé,* fl. & fr. 1841 (K, P); *Bernier,* fl. 1846 (P); Borbonie, *Boivin,* fl. 1854 (MEL); *Horne 340,* fl. Sept. 1871 (K); Mahé, *Schimper 106,* sapling March 1899 (UPS); Mt Harrison, *Schimper,* sapling March 1899 (K); Cascade Estate, *Thomasset,* 1901 (K); Mahé, *Thomasset 203,* fl. Feb. 1905 (K); Mahé, *d'Alleizette,* fl. Dec. 1906 (L); Mahé, *Thomasset (Sealark Exped.),* fl. Apr. 1908 (K); Silhouette, *Standley Gardiner (Sealark Exped.),* fl. Aug. 1909 (K); Cascade, Mahé, *Standley Gardiner (Sealark Exped.),* fl. and sapling 1908 (K); Mahé, *Thomasset (Sealark Exped.),* fl. (K); Cascade Forest, *Thomasset (Sealark Exped.),* fl. (K); Mahé, *Thomasset,* sapling 1912 (K); Trois Frères, Mahé, *Osborne-Day 238,* fl. Oct. 1936 (BM).

Distribution. Seychelle Islands, on several of the islands (Mahé, Praslin, and others). The species was a common tree of the mountains of the Seychelle group but is much reduced in numbers; it is being replanted on Crown Lands (J. N. Milsum in litt.).

Ecology. Mountainsides; the altitude has been noted only in 2 cases, being 700 and 850 m. From the data above a distinct flowering-time can not be indicated; the species was collected in flower in March, April, Sept., and Oct..

Vernacular names. *Bois marré blanc, Bois rouge,* and *Capucin* (Fr.).

Uses. A hardwood timber tree.

Notes. 1. Bernier's collection bears the indication Madagascar, but this is probably due to an error, as has been noted already by Baillon in herb..

2. The peculiar heterophylly has been discussed already in the introductory part (p. 12). The sketches, on which fig. 5 has been based, were kindly send to me by Mr J. N. Milsum, Director of Agriculture, who made these sketches in the field in September 1950 on my request.

19. Dillenia alata (DC. 1818) Martelli 1886

Wormia alata R. Br. ex DC., Syst. 1, 1818, p. 434; DC., Prod. 1, 1824, p. 75; Benth., Fl. Austr. 1, 1863, p. 16; Miq., Ann. Mus. Bot. Lugd. Bat. 4, 1868, p. 78;

F. v. M., Fragm. Phytogr. Austr. 7, 1871, p. 124; F. M. Bail., Synops. Queensl. Fl., 1883, p. 3; F. M. Bail., Queensl. Woods, 1886, p. 1 & 1888, p. 7; Maiden, Usef. Native Pl. Austr., 1889, p. 614; F. M. Bail., Queensl. Fl. 1, 1899, p. 10; *Banks & Soland., Ill. Bot. Capt. Cook's Voy. 1, 1900, p. 5, t. 1; **F. M. Bail., Compr. Cat. Queensl. Pl., 1909, p. 18, pl. 2; *Brass, J. Arn. Arb. 19, 1938, pl. 222 (photo of habitat).

Dillenia alata Banks ex DC., Syst. 1, 1818, p. 434, in syn.; (DC.) Martelli in Becc., Malesia 3, 1886, p. 157, descr. excl.; Hoogl., Fl. Mal. I, 4, 1951, p. 164.

Lenidia alata (DC.) Poir., Dict. Sc. Nat. 25, 1822, p. 448.

Wormia apetala *Gaud. in Freyc., Voy., Bot., 1826, p. 476, t. 99.

Dillenia apetala (Gaud.) Martelli ex Dur. & Jacks., Ind. Kew. Suppl. 1, 1906, p. 136.

Type specimens: *Wormia alata:* Banks, New S. Wales, Endeavour Riv., Point Look Out; holotype in BM, isotypes in E, P. — *Wormia apetala:* Gaudichaud, Uranie 1817—20, marais maritimes de Rawak, Vaigiou; holotype in P, isotype in G.

Evergreen trees, up to 20 m high, 60 cm thick. Bark reddish to dark reddish brown, peeling off in thin papery flakes. Branches crooked, sympodial, younger ones 2—$2^{1}/_{2}$ mm thick, glabrous to sparsely strigose-hirsute, glabrescent. Leaf-scars amplexicaul, for about $^{1}/_{2}$ single line, for $^{1}/_{2}$ V-shaped with ca 13 leaf-traces above middle in row parallel to upper margin. *Leaves* oval to ovate, (5—)8—16(—35) × ($3^{1}/_{2}$—)5—10(—20) cm, with (5—)9—12(—17) nerves on either side; rounded at apex and base, base for 2—3 mm connected with petiolar wings; margin entire, slightly recurved, nerves curving upward, not reaching margin; glabrous on both sides, shining, dark green above, duller, much lighter green beneath. Petiole $2^{1}/_{2}$—4 cm, glabrous, with amplexicaul wings; wings linear-lanceolate, 2—6 mm broad, narrowing towards base of blade, glabrous above, glabrous to sparsely strigose-hirsute beneath, partly caducous, on the lower $^{1}/_{2}$—$^{3}/_{5}$ of petiole for ca $^{1}/_{2}$ mm breadth, above this for whole breadth persistent. *Inflorescences* terminal, 2—4-flowered racemes, up to 12 cm long; axis glabrous, $1^{1}/_{2}$—2 mm thick, without bracts. *Flowers* ca $7^{1}/_{2}$ cm across. Pedicel $1^{1}/_{2}$—2 cm, 1—$1^{1}/_{2}$ mm thick, thickened to 3 mm at apex, glabrous, without bracteoles. Sepals 5, 2 outermost ones circular, ca 13 × 13 mm, 3 innermost ones oval-ovate, ca 20 × 15 mm, glabrous on both sides, ciliate at margin. Petals 5, yellow, obovate, ca 40 × 25 mm, rounded at apex, narrowed towards base. Stamens in 2 distinct groups, those of outer group (ca 100) slightly curved in bud, 7—8 mm long, those of inner group (ca 18) with apical part reflexed outward in bud, 11—13 mm long; filament of stamens of outer group 2—5, of those of inner group 1—$2^{1}/_{2}$ mm long, all 0.3—0.6 mm broad; anther 0.6—0.8 mm broad, obtuse at apex; thecae linear, opening with pore near apex on inner side. Carpels 6—8, arranged around rather broad conical receptacle, deep crimson, oblong, ca 10 × 4 mm, glabrous, each with ca 8 ovules; styles spreading, red, filamentous, ca 14 mm long, 0.4 mm thick. *Pseudocarps* dehiscent; carpels ca 18—20 × 10—14 mm, each with 0—3 seeds. Seeds obovoid, ca 4 × 3 mm, black with reticulate surface, enclosed by waxy-white, membranous aril.

New Guinea: Dutch S. New Guinea: *Zippelius 98/1,* fl. (L, U); Sungei Merauke, *Jaheri,* fl. Apr. 1901 (BZ); Kwalamul near Okaba, *Branderhorst 37,* fl. Aug. 1907 (BZ, K, L); near Merauke, *Versteeg 1928,* fl. Nov. 1907 (BZ, L, U); bivouac Amman hazin, *Anta 185,* fl. Aug. 1941 (BZ, L). — Terr. of Papua: Baxter's Riv., *McFarlane,* fr. (MEL); Wuroi, Oriomo Riv., Western Div., *Brass 5713,* fl. & fr. Jan. 1934 (A, BM, BRI, BZ, L, NY); Lake Daviumbu, Middle Fly Riv., *Brass 7571,* fl. Aug. 1936 (A, L). — Waigeo Isl.: Rawak, *Gaudichaud,* fl. 1818—9 (G, P).

Australia: Queensland, Endeavour Riv. (SING); *92* (MEL); Cape York, *Daemel*, fl. & fr. (BM, K, MEL); Rockingham Bay, *Dallachy*, fl. (MEL); Princess Charlotte Bay, *Hann Northern Exped. 163*, fl. (BRI); Cape York, *Hill 117*, fl. (K); *Rowan*, fl. (MEL); Cook Distr., Skardon Riv., *Whitehouse*, fl. (BRI); Endeavour Riv., Point Look Out, *Banks & Solander*, fl. 1770 (BM, E, P); Endeavour Riv., *Cunningham 206*, fl. July 1819 (BM, BRI, K, MEL); Cape York, *McGillavray 418*, fl. Oct. 1848 (K); Rockingham Bay, *Dallachy*, fl. Jan.—Feb. 1864 (MEL); Cape York, *Gull*, fr. Dec. 1867 (MEL); Fitzroy Isl., *Walter 35*, fr. 1871 (MEL); Cooktown & Daintree Riv., *Fitzalan*, fl. & fr. 1876 (MEL); *Bouel*, fl. Jan. 1881 (MEL); Trinity Bay, *Karsten*, fl. Feb. 1881 (MEL); Endeavour Riv., *Persietz*, fl. 1882 (MEL); ibidem, *Persietz 16*, 1884 (MEL); Cape York, *Hartmann*, fl. & fr. 1885 (MEL); *Lea*, fl. June—July 1886 (BM); Endeavour Riv., *Armit 13*, fl. & fr. 1886 (BRI); Mosman's Riv., *Sayer*, fl. 1886 (MEL); Cardwell, *Fristedt*, fl. June 1889 (S); *Johnson*, fl. 1889 (MEL); Cairns, *Betche*, Aug. 1901 (MEL); Moa Isl., *Bick 77*, fl. May 1911 (BRI); Cairns, *Kenny*, fr. Dec. 1911 (BRI); Herberton, *Hamilton*, fr. Jan. 1912 (BRI); Johnstone Riv., *Ladbrook*, fl. Oct. 1917 (BRI); Cairns, *Pekrie*, fl. Oct. 1928 (BRI); Cape York Pen., *Thomson 35*, fr. 1930 (BRI); Port Douglas, *Brass 2381*, fl. Jan. 1932 (A); Cairns, *Mauritzon*, fr. Dec. 1936 (S); Port Douglas, *Brass & White 146*, fl. Sept. 1937 (A, BRI); Bramston Beach, near Babinda, Cooke Distr., *Machenas*, fl. Oct. 1949 (BRI).

Cultivated: Hongkong, Botanic Garden, *Hance 22255*, fl. June 1883 (BM).

Locality unknown: *no 976.5* (LINN).

Distribution. Waigeo Island, S. New Guinea, and Queensland (E. coast only).

Ecology. In New Guinea in savannah forests; the only indication on the habitat in Queensland I was able to find was "in locis aquosis litori marino vicinis" (v. Mueller 1871, l. c.).

Vernacular names. *Eh* (Dutch S. New Guinea, *Anta 185*); *Bloodwood* (near Cairns, *Karsten*).

Uses. The wood, which has a pretty dark red colour, is easy to work and is used for furniture.

Note. The species was first described by De Candolle (1818 l. c.) under the name *Wormia alata*, already given by R. Brown in ms., with mention of the unpublished name *Dillenia alata* Banks as a synonym. According to the Rules of Nomenclature this is not a valid publication of this name. The first valid transfer to *Dillenia* was effected by Martelli (1886), who, however, mentioned a specimen of *D. ovalifolia*.

20. Dillenia auriculata Martelli 1886

Dillenia auriculata Martelli in Becc., Malesia 3, 1886, p. 159; Hoogl., Fl. Mal. I, 4, 1951, p. 165.

Wormia auriculata (Martelli) Gilg & Werderm. in Engl. & Prantl, Nat. Pfl. Fam. ed. 2, 21, 1925, p. 35; A. C. Smith, J. Arn. Arb. 22, 1941, p. 501.

Type specimen: Beccari PP 341, Ramoi, 8 June 1872; holotype in FI.

Slender evergreen trees, up to 30 m high. Bark reddish brown, flaky. Branches sympodial, younger ones ca $1^{1}/_{2}$ mm thick, glabrous to sparsely strigose, glabrescent. Leaf-scars amplexicaul, for about $^{2}/_{5}$—$^{1}/_{2}$ a single line, for $^{3}/_{5}$—$^{1}/_{2}$ semi-lunular with ca 9—11 leaf-traces somewhat below middle. Leaves oblong, (4—)7—16(—21) × (1.7—)3—7(—9) cm, with (6—)8—12 nerves on either side; rounded-obtuse to acute at apex, rounded to obtuse at base, slightly coherent with petiolar wings; margin entire to slightly undulate, nerves curving upward, anastomising with next one, sometimes with vein towards margin; glabrous above, glabrous except sometimes developed hairy domatia in axil of nerves beneath. Petiole

$1^{1}/_{2}$—5 cm, glabrous, with amplexicaul wings; wings linear-lanceolate, up to 7 mm broad, gradually narrowing towards apex, glabrous above, glabrous to sparsely strigose beneath, caducous except often small upper part, up to 5 mm long, remaining as 2 auricles below blade. *Inflorescences* terminal, 1—3-flowered racemes, up to 11 cm long; axis 3—2 mm thick, glabrous to sparsely strigose, without or with caducous bracts; bracts sessile, lanceolate, up to 15 × 4 mm. *Flowers* ca 8—10 cm across. Pedicel $1^{1}/_{2}$—4 cm, ca $1^{1}/_{2}$ mm thick, thickened to 3 mm at apex, glabrous to sparsely strigose, without bracteoles. Sepals 5, 2 outermost ones only slightly concave, broadly oval, ca 17—19 × 15—17 mm, 3 innermost ones more distinctly concave, oval, ca 25—30 × 20—24 mm, glabrous inside, glabrous to sparsely strigose outside, shortly ciliate at margin. Petals 5, yellow, narrowly obovate, ca 40 × 16 mm, rounded at apex, narrowed towards base. Stamens in 2 distinct groups, those of outer group (ca 225) slightly curved in bud, 8—10 mm long, those of inner group (ca 25—30) with apical part reflexed outward in bud, ca 18 mm long; filament 2—5 mm long, 0.2—0.5 mm broad; anther 0.8—1.0 mm broad, obtuse at apex; thecae linear, those of stamens of outer group opening with apical pores, of stamens of inner group with pores near apex on outer side. Carpels 6—10, arranged around conical receptacle, red, oblong, ca 8 × 3 mm, glabrous, each with 8—11 ovules; styles spreading, red, linear, ca 16 mm long, at base 0.8 mm broad, channelled above. *Pseudocarps* unknown.

New Guinea: Dutch W. New Guinea (Vogelkop): Ramoi, *Beccari PP 341*, fl. June 1872 (FI); Sorong, near Kadamak, *Pleyte 511*, fl. Aug. 1948 (BZ, L). — Papua: Fly Riv., 528 mile camp, *Brass 6821*, fl. May 1936 (A, L); Fly Riv., Palmer Riv., *Brass 7275*, fl. July 1936 (A, L). — Terr. of New Guinea: along Jemur Riv., *Schlechter 20007*, fl. Sept. 1909 (BR, K, P, UC); *NGF 2771* (BRI).

Distribution. New Guinea.

Ecology. In dense forest along rivers or on ridges, at low altitudes.

21. Dillenia castaneifolia (Miq. 1868) Martelli ex Dur. & Jacks. 1902

Wormia castaneifolia Miq., Ann. Mus. Bot. Lugd. Bat. 4, 1868, p. 78; Martelli in Becc., Malesia 3, 1886, p. 164 (*castaneaefolia*); Hook.f. & Jacks., Ind. Kew. 2, 1895, p. 1233 (*castanaefolia*).

Wormia macdonaldi F. v. M., Vict. Natural. 2, 1886, p. 146; F. v. M., Bot. Centr. Bl. 26, 1886, p. 114.

Dillenia misorensis Martelli in Becc., Malesia 3, 1886, p. 160.

Dillenia albertisiana Martelli in Becc., Malesia 3, 1886, p. 161.

Wormia longepetiolata Warb., Bot. Jahrb. 13, 1891, p. 378.

Dillenia pedunculata Schum. & Laut., Fl. Deut. Schutzgeb. Südsee, 1901, p. 445.

Dillenia castaneifolia (Miq.) Martelli ex Dur. & Jacks., Ind. Kew. Suppl. 1, 1902, p. 136 (*castaneaefolia*); Diels, Bot. Jahrb. 57, 1922, p. 438; Hoogl., Fl. Mal. I, 4, 1951, p. 165.

Dillenia macdonaldi (F. v. M.) Martelli ex Dur. & Jacks., Ind. Kew. Suppl. 1, 1902, p. 136.

Wormia hirta Ridl., Trans. Linn. Soc. Bot. 9, 1916, p. 13.

Dillenia longepetiolata (Warb.) Diels, Bot. Jahrb. 57, 1922, p. 436.

Dillenia hirta (Ridl.) Diels, Bot. Jahrb. 57, 1922, p. 436.

Dillenia castaneifolia var. dolichobotrys Diels, Bot. Jahrb. 57, 1922, p. 439.

Wormia misorensis (Martelli) Gilg & Werderm. in Engl. & Prantl, Nat. Pfl. Fam. ed. 2, 21, 1925, p. 35.

Dillenia alata var. macrophylla Auct. non Laut.; Lane-Poole, Rep. For. Res. Papua, 1925, p. 116.

Type specimens: *Wormia castaneifolia:* Zippelius 121/0, Nova Guinea; holotype in L, isotype in U. — *Wormia macdonaldi:* Baeuerlen, Strickland River; not seen, according to Mr Jessup (in litt.) not in MEL. — *Dillenia misorensis:* Beccari PP, Geelvink Bay, Korido on Misori, May 1875; holotype in FI. — *Dillenia albertisiana:* d'Albertis, Fly River, 1877; holotype in FI. — *Wormia longepetiolata:* Warburg 20073, Deutsch Neu-Guinea; isotype in A. — *Dillenia pedunculata:* I have seen none of the specimens cited by Schum. & Laut., probably all are lost. — *Wormia hirta:* Kloss (Wollaston Exped.), Canoe Camp, 5 Dec. 1912; holotype in BM, isotypes in K, SING. — *Dillenia castaneifolia var. dolichobotrys:* Schlechter 18910, Kaiser Wilhelmsland, Wälder der Saugeti-Etappe, 2 Dec. 1908; isotypes in A, G, K, L, NY, S.

Evergreen trees, up to 20 (or 40?) m high, 50 cm thick. Heartwood light brown. Branches sympodial, younger ones $1^1/_2$—3 mm thick, glabrous to hirsute, glabrescent. Leaf-scars amplexicaul, for about $^1/_2$ single line, for $^1/_2$ semi-lunular to subfalcate, slightly emarginate in upper margin, with ca 13 leaf-traces in lower part. *Leaves* oblong, less often elliptic-oblong, (8—)13—20(—30) × (3—)$6^1/_2$—12(—18) cm, with (8—)10—16 (—20) nerves on either side; acute to rounded at apex and base, for breadth of 1—4 mm connected with petiolar wings; margin entire to slightly dentate, nerves curving upward, either ending in apex of teeth or not reaching margin, with vein towards margin; glabrous to sparsely villose, most densely so along midrib above, sparsely strigose on nerves and midrib, often soon glabrescent, glabrous on intervenium beneath. Petiole $1^1/_2$—6 cm, glabrous above, glabrous to hirsute beneath, with amplexicaul wings; wings lanceolate, 4—7 mm broad, glabrous above, glabrous to hirsute beneath, wholly caducous. *Inflorescences* terminal, 1—6-flowered racemes, up to 30 cm long; axis $1^1/_2$—3(—6) mm thick, glabrous to slightly hirsute, without bracts. *Flowers* $6^1/_2$—9 cm across. Pedicel 5—20 mm, $1^1/_2$—$2^1/_2$ mm thick, thickened to $2^1/_2$—4 mm at apex, glabrous to hirsute, without bracteoles. Sepals 5, yellowish green, often with some red, 2 outermost ones oval to circular, ca 15 × 12—15 mm, 3 innermost ones obovate, 20—30 × 15—18 mm, glabrous inside, glabrous to sparsely villose outside, ciliate at margin. Petals 5, deep lemon yellow, obovate, 4—5 × $2^1/_2$—3 mm, rounded at apex, narrowed towards base. Stamens in 2 distinct groups, those of outer group (ca 250—300) slightly curved in bud, $6^1/_2$—8 mm long, those of inner group (ca 23—35) with apical part reflexed outward in bud, 11—14 mm long; outside outer stamens often some (up to 25) staminodes, linear, 5—10 mm long, 0.2—0.3 mm broad; filament 2—6 mm long, ca 0.3 mm broad; anther 0.7—0.9 mm broad, obtuse, slightly emarginate at apex; thecae linear, opening with pore near apex on inner side in stamens of outer group, on outer side in those of inner group. Carpels 8—10, arranged around conical receptacle, red, lanceolate, ca 6—7 × $1^1/_2$—2 mm, glabrous, each with (4—)6—12(—15) ovules; styles spreading, white or yellowish red, cylindric, 9—11 mm long, 0.5 mm thick at base, narrowing to 0.2 mm at apex, slightly flattened to channelled above. *Pseudocarps* dehiscent, when ripe sepals carmine red, enlarged to 30—40 × 17—20 mm; carpels 15 × 10 mm, each with 0—1 seed. Seeds obovoid, ca 4 × $3^1/_2$ mm, enclosed by membranous aril.

New Guinea: *Zippelius 121/0,* fr. (L, U); *Kanehira 1836,* fr. Aug. 1932 (NY). — Dutch W. New Guinea (Vogelkop): Manokwari, *Herre 371,* fl. Jan. 1929 (NY); ibidem, *Nielsen 835,* fl. July 1929 (C); near Rauna, *NIFS bb 22535,* fl. & fr. Apr. 1937 (A, BZ, L); Manokwari, *Kostermans 2852,* fl. July 1948 (BZ, L); Sorong, near Klamono, *Pleyte 618,* fl. Aug. 1948 (BZ, L). — Dutch N. New Guinea: Begown Riv., *Gjellerup 208,* fl. & fr. June 1910 (BRSL, BZ, K, L, U); Mamberamo, Pioniersbivak, *Thomsen 631,* fl. Apr. 1914 (BZ, K, L); Mamberamo, *Thomsen 814,* fl. Aug. 1914 (BZ, K, L, U); ibidem, *Feuilletau de Bruyn 72,* fl. Sept. 1914 (L); Otke Riv., *Lam 477,* fl. & fr. June 1920 (BZ, K, L); Pioniersbivak, *Lam 485,* fl. & fr. June 1920 (BZ, L); Albatros Bivak, *Docters van Leeuwen 9152,* fl. Aug. 1926 (BZ, L); Rouffaer Riv., *Docters van Leeuwen 9713,* fl. Aug. 1926 (BZ, L); Motorbivak, *Docters van Leeuwen 11127,* fl. Nov. 1926 (BZ, L); Albatros Bivak, *Docters van Leeuwen 11221,* fl. & fr. Nov. 1926 (BZ, L); Bernhard Camp, Idenburg Riv., *Brass 14035,* fr. Apr. 1939 (A, L); near Berap (Nimburan), *NIFS bb 28988,* fl. Aug. 1939 (A, BZ, L, SING); near Nungguaku, *NIFS bb 30605,* Sept. 1939 (A, BZ, L, SING). — Dutch S. New Guinea: *Versteeg 1175,* fl. May 1907 (BZ); Canoe Camp, *Kloss,* fl. Dec. 1912 (BM, K, SING); Najaja, near Uta, *Aet 327,* fl. June 1941 (BZ, L); ibidem, *Aet 344,* fl. June 1941 (BZ, L). — Terr. of Papua: Fly Riv., *d'Albertis,* fr. 1876 (MEL); ibidem, *d'Albertis,* fl. 1877 (FI). — Terr. of New Guinea: Sepik Riv., *Bateson 14,* fl. (K); Sigar, *Warburg 20073,* fl. (A); Kaulo Riv., *Schlechter 16994,* fl. & fr. Dec. 1907 (P, SING, UC); Saugeti-Etappe, *Schlechter 18910,* fl. Dec. 1908 (A, G, K, L, NY, S); Sepik, *Ledermann 6752,* 1912—13 (E, K, SING); Ramu, *Lane-Poole 631,* Feb. 1924 (BRI); Sepik Riv., near Tsenap, *Herre 298,* fl. & fr. May 1929 (BZ, NY); May Riv., *Herre 308,* fl. May 1929 (BZ, L, NY); August Riv., Sepik Distr., *Womersley NGF 3823,* fr. Sept. 1949 (L); Sepik Riv. near Yellow Riv., *Womersley NGF 3850,* fl. Sept. 1949 (L). — Schouten Isls: Korido, Misori, *Beccari PP,* fl. May 1875 (FI). — Japen Isl.: Fèrèrèfi near Serui, *Aet & Idjan 336,* fl. Aug. 1939 (BZ, L).

Distribution. New Guinea and some of the islands in the Geelvink Bay (Japen, Korido).

Ecology. Dense forests, usually on riversides, sometimes in swamps, at low altitudes (up to 200 m).

Vernacular names. *Oesang* and *Wesang* (Nimburan).

Note. The species is very variable as to size of the leaves and length of the inflorescences. Distinct groups which justify the distinction of separate species or lower taxa are not found as many intermediates occur.

22. Dillenia bolsteri Merr. 1912

Dillenia bolsteri Merr., Philip. J. Sc. Bot. 7, 1912, p. 305; Merr., En. Philip. Fl. Pl. 3, 1923, p. 59; Hoogl., Fl. Mal. I, 4, 1951, p. 165.

Dillenia cauliflora Merr., Philip. J. Sc. Bot. 9, 1914, p. 517 (issued 1915); Merr., En. Philip. Fl. Pl. 3, 1923, p. 60.

Type specimens: *Dillenia bolsteri:* Bolster 311, Surigao, Surigao Prov., Mindanao, Philippines, Apr. 1906; probably lost; Ramos & Pascasio BS 34784, Surigao Prov., Mindanao, June 1919; neoholotype in L, isotypes in A, BM, BZ, K, P, US. — *Dillenia cauliflora:* Ramos BS 1695, Samar, Apr. 1914; isotypes in BM, BRI, BZ, CAL, G, L, MO, NY, P, SING, US.

Fig. 6, p. 55.

Evergreen trees, up to 20 m high. Branches sympodial, younger ones ca $2^{1}/_{2}$ mm thick, sparsely pubescent, glabrescent. Leaf-scars amplexicaul, for about $^{1}/_{2}$ single line, for $^{1}/_{2}$ rather high, rounded at lower, slightly emarginate at upper margin, with ca 13 leaf-traces in lower half. *Leaves* elliptic-oblong or ovate, (8—)12—24(—30) × (3.3—)5—10(—$12^{1}/_{2}$) cm, with (13—)15—18(—22) nerves on either side; acuminate with ca 1 cm long acumen at apex, acute to obtuse at base, not connected with petiolar

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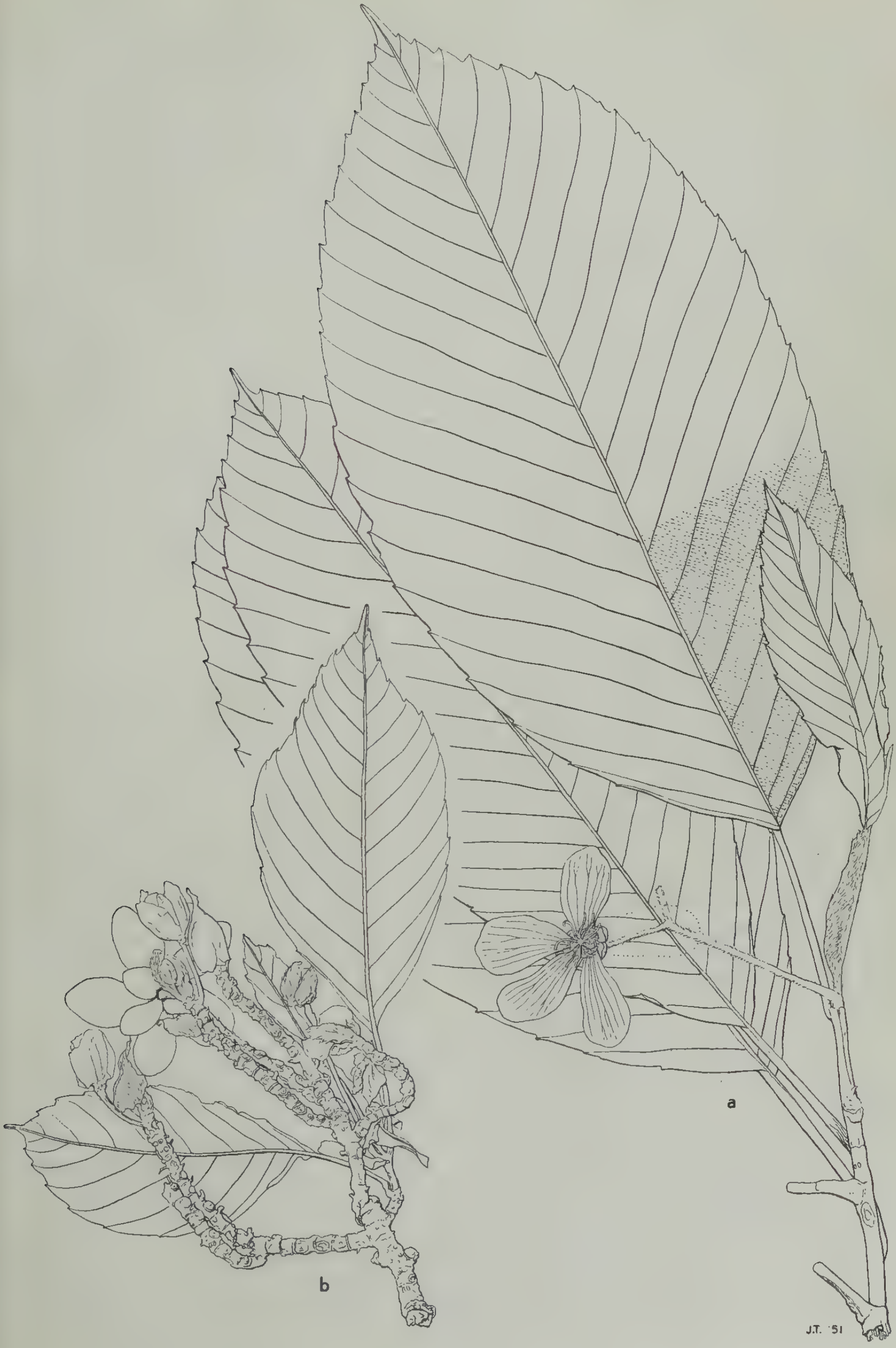
Fig. 6 — *Dillenia bolsteri* Merr. (p. 54); a. branch with terminal inflorescence, × ½; b. cauline inflorescence with some poorly developed leaves, × ½; a after *Wenzel 3112,* b after *Sulit PNH 6144.*


a
b
J.T. '51

wings; margin slightly dentate, usually most strongly so in upper half of blade, nerves only slightly curving upward, ending in apex of teeth; pubescent with up to 2 mm long hairs, glabrescent above, pubescent with on intervenium up to $^{1}/_{2}$ mm, on nerves up to 2 mm long hairs beneath. Petiole 2—$4^{1}/_{2}$ cm, glabrous above, pubescent beneath, with amplexicaul wings; wings lanceolate, 4—6 mm broad, glabrous above, villose-pubescent beneath with up to 3 mm long hairs, wholly caducous. *Inflorescences* terminal or cauline; if terminal 2—4-flowered, up to 10 cm long racemes; axis ca 1—$1^{1}/_{2}$ mm thick, hirsute, usually with large number of lenticels; bracts caducous, sessile, lanceolate, ca 5 × 2 mm; if cauline, woody with up to 15 cm long, at base up to 1 cm thick central axis, usually with several lateral branches up to 8 cm long, up to 4 mm thick, with flowers solitary or in 2-flowered racemes terminal on these, consequently sympodial branches; on branches scars of bracts and those of flowers or inflorescences alternating, spirally arranged; bracts representing petiole with petiolar wings of leaf, on which blade has been reduced, ovate, conduplicate, ca 10—20 mm long, 2 × 5—10 mm broad, glabrous above, pubescent beneath, blade usually completely reduced, sometimes up to 6 × 4 mm; scars of flowers or inflorescences elliptic, ca $2^{1}/_{2}$—3 mm high, $3^{1}/_{2}$—4 mm broad, those of bracts amplexicaul, single line, hardly broader at central nerve opposite scar of flower above it, often small pseudoaxillary bud above scar of central nerve on axillary, sympodial continuation of axis. *Flowers* ca 6 mm across. Pedicel 3—7 cm, $1^{1}/_{2}$ mm thick, thickened to $2^{1}/_{2}$ mm at apex, hirsute like axis of inflorescence. Sepals 5, oval, ca 20 × 16 mm, glabrous on both sides, ciliate at margin. Petals 5, white, obovate, ca 30 × 13 mm, rounded at apex, narrowed towards base. Stamens in 2 distinct groups, those of outer group (ca 160) slightly curved in bud, 5—$5^{1}/_{2}$ mm long, those of inner group (ca 25—30) with apical part reflexed outward in bud, 7—$8^{1}/_{2}$ mm long; filament 1—3 mm long, 0.2—0.3 mm broad; anther 0.6—0.7 mm broad, obtuse at apex; thecae linear, opening with pore near apex on inner side. Carpels 8—10, arranged around rather narrow conical receptacle, elliptic, ca 6 × 3 mm, glabrous, each with 6—8 ovules; styles spreading, cylindric, ca 7 mm long, at base 0.5, near apex 0.1 mm thick, channelled above. *Pseudocarps* indehiscent, about globular, ca $2^{1}/_{2}$ cm diam. including enclosing sepals which are up to 30 × 30 mm, ca 0.4 mm thick at base; carpels ca 15 × 9 mm, 1-seeded. Seeds obovoid, slightly curved, ca 5 × $3^{1}/_{2}$ mm, exarillate.

Philippines: Samar: *Cuming 1728*, fl. (BM, CGE, FI, G, K); *Ramos BS 1695*, fr. Apr. 1914 (BM, BRI, BZ, CAL, G, L, MO, NY, P, SING, US); Kadapnan, Oras, *Castro PNH 5710*, fr. May 1948 (A); Sitio Tinane, Loquilocon, Wright, *Sulit PNH 6144*, fl. & fr. May 1948 (A, L). — Leyte: *Wenzel 954*, fl. & fr. July 1914 (A, G, MO, NY); *Wenzel 1419*, fr. July 1915 (BM). — Mindanao: Surigao Prov., *Ramos & Pascasio BS 34784*, fl. & fr. June 1919 (A, BM, BZ, K, L, P, US); Mamfayang Tubud Placer, Surigao Prov., *Wenzel 3 J*, fl. July 1926 (UC); ibidem, *Wenzel 3112*, fl. Sept. 1927 (A, G, GH, K, M, MO, P, UC); Sukailang, Surigao, *Mendozo & Convocar PNH 10289*, fl. & fr. March 1947 (A).

Distribution. Philippines; Samar, Leyte, and Surigao Province of Mindanao only.

Ecology. In forests at low altitude (100—150 m).

23. Dillenia diantha Hoogl. spec. nov.

Dillenia luzoniensis Auct. non (Vidal) Martelli ex Dur. & Jacks.; Merr., En. Philip. Fl. Pl. 3, 1923, p. 60, p.p..

Dillenia diantha Hoogl., Fl. Mal. I, 4, 1951, p. 165, descr. angl..

Type specimen: Whitford 1320, Lamao Riv., Mt Mariveles, Bataan Prov., Luzon, June 1905; holotype in NY, isotypes in G, K, P, US.

Descriptio typi: Rami novelli sparsim hirsuti; cicatrices amplexicaules. Folia elliptico-oblonga, 4—10 × 2.8—5.7 cm, 11—12-nervata, apice rotundata vel obtusa, basi obtusa, decurrente, margine undulata; supra lucida. Petiolus 15—25 mm longus, alatus alis amplexicaulibus, caducis. Inflorescentiae terminales, uni- vel biflorae. Flores diametro ca 9 cm, pedicello 1.3—2.0 cm. Sepala 5, ovalia, ca 22 × 15 mm, intus glabra, extus hirsuta, margine ciliata. Petala 5, obovata, ca 45 × 29 mm. Stamina ∞, exteriora (ca 155) in alabastro paulo curvata, 9—10 mm longa, interiora (ca 20) in alabastro apice recurvata, 13—15 mm longa. Carpella 8—9, glabra, lanceolata, ca 9 × 2½ mm, 9—11-ovulata, stylis recurvatis ca 15 mm longis.

Fig. 7, p. 58.

Evergreen trees, up to 25 m high, 60 cm thick. Branches sympodial, younger ones 1½—2 mm thick, glabrous to hirsute with 0.3—0.5 mm long, rather rigid hairs, glabrescent. Leaf-scars amplexicaul, for about ½ single line, for ½ semi-lunular, slightly emarginate at upper margin, with ca 7—9 leaf-traces in lower half. *Leaves* subcoriaceous, oval to oblong, (3½—)6—12(—16) × (2.2—)4½—7½(—11) cm, with 5—8 nerves on either side; rounded to obtuse or retuse at apex, rounded to obtuse at base, not connected with petiolar wings; margin slightly undulate to dentate, nerves curving upward, not reaching margin, with vein towards margin; glabrous, shining on both sides. Petiole 15—40 mm, glabrous, with amplexicaul wings; wings lanceolate, 1—2 mm broad, rounded or auriculiform at apex, glabrous on both sides, wholly caducous. *Inflorescences* terminal, usually 2-flowered racemes, less often flowers solitary; axis 1½—4 cm long, glabrous to hirsute like younger branches; bracts caducous. *Flowers* ca 9 cm across. Pedicel 1—5 cm, 1½—2 mm thick, thickened to 3—4 mm at apex, glabrous to hirsute like younger branches, without bracteoles. Sepals 5, oval, ca 22 × 15 mm, glabrous inside, rather sparsely shortly hirsute outside, ciliate at margin. Petals 5, yellow, obovate, ca 45 × 29 mm, rounded at apex, narrowed towards base. Stamens in 2 distinct groups, those of outer group (ca 155) slightly curved in bud, ca 9—10 mm long, those of inner group (ca 20) with apical part reflexed outward in bud, 13—15 mm long; filament of stamens of outer group 4—6 mm long, ca 0.5, at base up to 0.8 mm broad, of those of inner group 7—10 mm long, ca 0.5, at base 0.7—1.2 mm broad; anther 0.7—1.0 mm broad, rounded to slightly emarginate at apex; thecae linear, opening with pore near apex on outer side. Carpels (5—)7—9, arranged around conical receptacle, lanceolate, ca 9 × 2½ mm, glabrous to sparsely shortly hirsute, mainly in apical part, each with 9—11 ovules; styles spreading, cylindric, ca 15 mm long, 1.2 mm thick near base, 0.3 mm near apex, channelled above; apical part of wall of carpels inside and stylar canal hirsute with ca 1 mm long upward directed hairs. *Pseudocarps* dehiscent, enclosing sepals enlarged to ca 28 × 20 mm; carpels ca 18 × 16 mm. Seeds unknown.

Philippines: Luzon: Lamao Riv., Mt Mariveles, Bataan Prov., *Borden FB 3063*, fl. May 1905 (BZ, K, NY, SING, US); ibidem, *Whitford 1320*, fl. June 1905

(G, K, NY, P, US); Paningtingan, Montalban, Rizal Prov., *Loher 13239,* fr. (UC); Balacbac, Rizal Prov., *Loher 14940,* fl. June 1912 (A, M, UC); Claveria, Cagayan Prov., *Lizardo FB 30566,* fl. Feb. 1928 (SING, UC); Kinatakutan, Tayabas Prov., *Oro FB 30799,* fr. Feb. 1929 (NY, SING); Bangui, Ilocos Norte Prov., *Paraiso FB 31262,* fr. Aug. 1930 (NY).

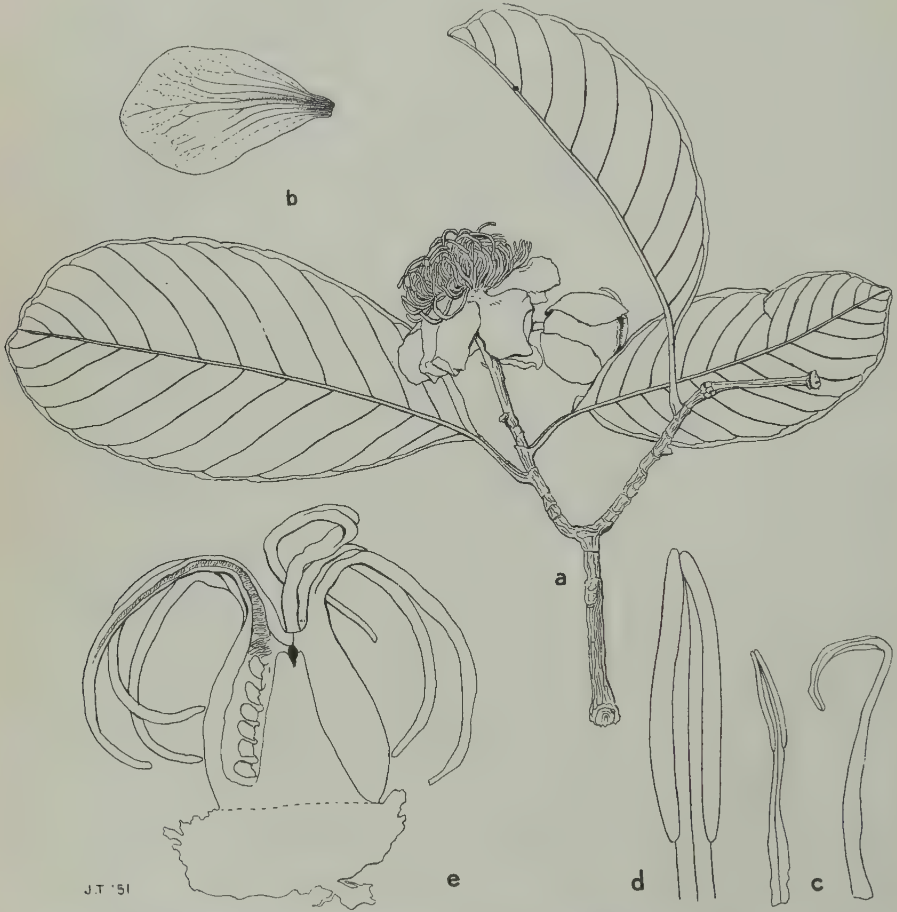


Fig. 7 — *Dillenia diantha* Hoogl. (p. 57); a. flowering branch, flower with petals already fallen off, × $^{2}/_{3}$; b. petal, × $^{2}/_{3}$; c. stamens from outer (left) and inner group, × 3; d. anther from stamen of outer group, × 8; e. gynoecium, longitudinal section, × 3; all after type specimen.

Distribution. Philippines, Luzon only.

Ecology. In forests at low altitude, up to 400 m.

Vernacular names. *Banacao* (Ibn.). Of the vernacular names mentioned by Merrill (1923) under *D. luzoniensis* the following may be attributed to the present species: *Katmón* (Is., Sbl., Tag.), *Magatali* (Ibn.), *Malakatmón* (Sbl., Tag.), *Malaliring* (Neg.), *Pangilinon* (Sbl.), *Paninggi-non* (Sbl.), and *Pamamalíen* (Pang.).

Uses. Timber used for house construction as beams, flooring, etc. (*Lizardo*).

Note. The species in habit of the leaf closely resembles *D. luzoniensis* and *D. monandra* from which it is immediately distinguished by the amplexicaul petiolar wings and, later on, leaf-scars. Merrill (1923) included a number of specimens of the present species under *D. luzoniensis*.

24. Dillenia talaudensis Hoogl. spec. nov.

Dillenia talaudensis Hoogl. Fl. Mal. I, 4, 1951, p. 164, descr. angl..

Type specimen: Lam 3072, Salibabu, Talaud Isls, 21 May 1926; holotype in L, isotype in BZ.

Descriptio typi: Rami novelli glabri; cicatrices amplexicaules. Folia elliptica, 20—30 × 14—21 cm, 18—20-nervata, apice obtusa vel rotundata, minute acuminata, basi rotundata, margine minute dentata. Petiolus $3^{1}/_{2}$—5 cm, alis amplexicaulibus, obovatis, usque ad 12 mm latis, apice obtusa insertionem excedente, caducis. Inflorescentiae bi- vel triflores, terminales. Alabastra subglobosa, ca $1^{1}/_{2}$ cm diam., pedicello 7—10 mm longo. Sepala 5, 2 exteriora suborbicularia, ca 21 × 19 mm, 3 interiora ovalia, ca 30 × 22 mm, glabra. Petala 5, in alabastro usque ad 22 × 15 mm. Stamina ∞, exteriora (ca 240) in alabastro ca 6 mm longa, paulo curvata, interiora (ca 80) in alabastro ca 11 mm longa, apice recurvata. Carpella 14, glabra, lanceolata, in alabastro ca 5 × 1.3 mm, 8—11-ovulata, stylis recurvatis ca 11 mm longis.

Fig. 8 a—d, p. 67.

Small evergreen trees, ca 8 m high, 11 cm thick. Branches sympodial, younger ones 3—4 mm thick, glabrous, older ones with rather numerous lenticels. Leaf-scars amplexicaul, for about $^{1}/_{2}$—$^{3}/_{5}$ single line, for $^{1}/_{2}$—$^{2}/_{5}$ rather highly semi-lunular, nearly triangular, with rounded angles, with ca 9 leaf-traces in lower half. *Leaves* elliptic to ovate, 20—30 × 14—21 cm, with 18—20 nerves on either side; obtuse to rounded, slightly acuminate with ca $^{1}/_{2}$ cm long acumen at apex, rounded at base, very slightly decurrent, not connected with petiolar wings; margin slightly dentate, nerves slightly curving upward, ending in apex of teeth; glabrous on both sides. Petiole $3^{1}/_{2}$—5 cm, glabrous, with amplexicaul wings; wings obovate, near base ca 4, near apex ca 12 mm broad, apex exceeding insertion to petiole for ca 5 mm, ending in mucronate acumen, wholly caducous. *Inflorescences* terminal, 2—3-flowered racemes, 10—12 cm long; axis ca 3 mm thick, glabrous, without bracts. *Flowers* only known in bud and as unripe fruit. Pedicel 7—10 mm, ca $2^{1}/_{2}$—3 mm thick, thickened to 5 mm at apex, glabrous, without bracteoles. Sepals 5, 2 outermost ones about circular, 20—22 × 18—20 mm, 3 innermost ones oval, 28—30 × 22—23 mm, glabrous on both sides, ciliate at margin. Petals 5, obovate, in bud up to 22 × 15 mm, rounded at apex, narrowed towards base. Stamens in 2 distinct groups, those of outer group (ca 240) slightly curved in bud, ca 6 mm long in bud, 10—11 mm in young fruit, those of inner group (ca 80) with apical part reflexed outward in bud, ca 11 mm long in bud, 18—20 mm in young fruit; filament 1—3 mm long, in stamens of outer group 0.2—0.4 mm broad, in those of inner group 0.4—0.6 mm broad; anther ca 0.5—0.8 mm broad, slightly mucronate at apex; thecae linear, those of stamens of outer group opening with apical pore, those of stamens of inner group opening with pore near apex on outer side. Carpels 14, arranged around rather narrow conical receptacle, lanceolate, ca 5 × 1.3 mm in bud, 12 × $5^{1}/_{2}$ mm in young fruit, glabrous, each with 8—11 ovules; styles spreading, cylindric, channelled above, ca 11 mm long in bud, ca 20 mm in young fruit, near base ca 0.5 mm, near apex ca 0.1 mm thick. *Pseudocarps* only known unripe, sepals then up to 40 × 25 mm.

Moluccas: Talaud Isls: Salibabu Isl., S of Lirung, *Lam 3072*, fl. & fr. May 1926 (BZ, L).

Distribution. Moluccas, known only from Salibabu Island (Talaud Islands).

Ecology. On the type-locality common in secondary forest.

Vernacular name. *Luaran'a* (Talaurese).

Uses. The fruits are eaten uncooked.

25. Dillenia ochreata (Miq. 1868) Teysm. & Binn. ex Martelli 1886

Dillenia ochreata Teysm. & Binn., Cat. Hort. Bot. Bog., 1866, p. 178, nomen nudum; Martelli in Becc., Malesia 3, 1886, p. 166; Heyne, Nutt. Pl. Indon., 1950, p. 1072; Hoogl., Fl. Mal. I, 4, 1951, p. 164.

Wormia ochreata **Miq., Ann. Mus. Bot. Lugd. Bat. 4, 1868, p. 77, t. 1; Koord., Meded. Plantent. 19, 1898, p. 327.

Type specimen: Forsten, in the forests near Likupang, Celebes, 10 Sept. 1860; lectoholotype in L.

Evergreen trees, up to ca 15 m high, 35 cm thick, with up to 6 m bole. Branches sympodial, younger ones 1—2 mm thick, hirsute with 1—2 mm long, rather rigid hairs, glabrescent. Leaf-scars amplexicaul, for about $^{2}/_{3}$ single line, for $^{1}/_{3}$ triangular with rounded downward directed apex, with ca 9 leaf-traces somewhat below middle. *Leaves* ovate or elliptic-oblong, (5—)10—20(—26) × (1.8—)$4^{1}/_{2}$—10(—14) cm, with (12—)15—18 nerves on either side; acute, often slightly acuminate, to obtuse at apex, rounded to acute at base, very slightly decurrent, not connected with petiolar wings; margin slightly dentate to nearly entire, nerves nearly straight, only slightly curving upward ca 1—2 cm from margin, ending in apex of teeth; glabrous on both sides. Petiole 16—20 (—24) mm, glabrous, with amplexicaul wings; wings half-obcordiform, 16—18 mm long, 13—15 mm broad, with entire margin, glabrous on both sides, wholly caducous. *Flowers* solitary, terminal, ca 6—8 cm across. Pedicel $2^{1}/_{2}$—5(—7) cm, ca $1^{1}/_{2}$—3 mm thick, thickened to 3—5 mm at apex, hirsute like younger branches, without bracteoles or 1 bracteole ca 1 cm below the flower; bracteole with ca 10 mm long petiole and conduplicate blade ca 6 × 4 mm. Sepals 5, about circular, 2 outermost ones ca 20, 3 innermost ones ca 25 mm diam., glabrous on both sides, not or sparsely ciliate at margin. Petals 5, yellow, obovate, ca 40 × 35 mm, rounded at apex, narrowed towards base. Stamens ca 165, in 2 not sharply separated groups; outermost ones slightly curved in bud, $7^{1}/_{2}$—8 mm long, innermost ones with apical part reflexed outward in bud, ca 11—12 mm long; filament 2—3 mm long; anther ca 0.7—0.8 mm broad, slightly acuminate at apex; thecae linear, opening with apical pore. Carpels 6—9, arranged around cuneate receptacle, oblong, ca 7 × $2^{1}/_{2}$ mm, glabrous, each with 8 ovules; styles slightly spreading, ca 7 mm long, ca 0.8 mm thick near base, 0.2 mm near apex, channelled above. *Pseudocarps* indehiscent, pale green, about globular, ca 32 mm diam., 26 mm high including enclosing sepals which are ca 40 × 35 mm, ca 2 mm thick at base; carpels very slightly spirally twisted, thinly fleshy, ca 15 × 12 mm, 0—1-seeded. Seeds obovoid, ca 5 × 4 mm, very finely densely echinate with $^1/_2$ mm long spines, enclosed by 10 mm long rather fleshy aril.

Celebes: N. Pen.: Manado, fl. (K, L); Tondano (L); *Teysmann & de Vriese*, fl. & fr. 1860 (CAL, K, L, MEL, S); near Likupang, *Forsten*, fr. Sept. 1860 (L); Manado, *5324 HB* (BZ, U); ibidem, *5330 HB*, fl. (BZ, CAL, U); ibidem, *5847 HB*, fl. (BZ, U); ibidem, *Riedel*, fl. & fr. (L); near Semboki, *Koorders 16709β* (BZ); Lulumbulan Forest near Pahu-uru, *Koorders 16710β*, Apr. 1895 (BZ, K, L); near Ratatotok, *Koorders 16711β*, fr. (BZ); Makalongso Forest, Tondano, *Koorders 16712β*, fl. & fr. Jan. 1895 (BZ, L); Kajuwatu, *Koorders 16713β*, Jan. 1895 (BZ); Panamarangan Mts, Kakas, *Koorders 16714β*, fr. Jan. 1895 (BZ, K, L); near Negatei, *NIFS bb 7528*, fl. Oct. 1924 (BZ); Kinalusan, *NIFS bb 12657*, fl. Aug. 1928 (BZ); Tonsealama, *Wisse 97*, fl. & fr. Dec. 1932 (BZ, WAG); Amurang, near Pinaling, *NIFS bb 17563*, fr. June 1933 (A, BZ, L); Boalemo, near Popaja, *NIFS bb 18085*, fr. Dec. 1933 (A, BZ).

Cultivated: Bot. Gard. Bogor (from Manado): *Kurz*, fl. & fr. (BZ, CAL, K); *Beccari*, fl. (FI); *Beccari*, fl. 1876 (FI); no IV-G-36, fl. (BZ, L); no IV-G-36a, fl. & fr. (BZ, CAL, K, L).

Distribution. Celebes, Minahasa only.

Ecology. In primary forests up to 800 m altitude.

Vernacular names. *Dengilo maluo* (Gorontalese), *Kelemur* (Alfurese), *Marerer* (Tompokewan), *Ngeher*, *Rerer*.

26. Dillenia megalantha Merr. 1914

Dillenia megalantha Merr., Philip. J. Sc. Bot. 9, 1914, p. 519 (exact date of publication 20. III. 1915); Brown, Minor Prod. Philip. For. 2, 1921, p. 338; Wester, Philip. Agric. Rev. 14, 1921, p. 242; Merr., En. Philip. Fl. Pl. 3, 1923, p. 60; Hoogl., Fl. Mal. I, 4, 1951, p. 163.

Dillenia mindanaensis Elm., Leafl. Philip. Bot. 7, 1915, p. 2611 (exact date of publication 27. III. 1915); *Wester, Philip. Agric. Rev. 14, 1921, p. 287, t. 27b (photo of fruit); Merr., En. Philip. Fl. Pl. 3, 1923, p. 60.

Wormia megalantha (Merr.) Gilg & Werderm. in Engl. & Prantl, Nat. Pfl. Fam. ed. 2, 21, 1925, p. 35.

Type specimens: *Dillenia megalantha:* Ramos BS 17581, Samar, March—April 1914; lectoholotype (isotype) in BM, isotypes in K, P, US. — *Dillenia mindanaensis:* Elmer 11883, Todaya (Mt Apo), Distr. of Davao, Mindanao, Sept. 1909; isotypes in A, BM, BZ, CAL, E, FI, G, K, L, MO, NY, US.

Evergreen trees, up to 20 (40?) m high, 40 (or more?) cm thick. Bark brown and grey mottled, peeling off in small thin plates. Branches sympodial, younger ones 5—8 mm thick, glabrous to densely hirsute, most densely so in axil of leaves, slightly less densely above amplexicaul scars, glabrescent. Leaf-scars amplexicaul, for about $^1/_2$ up to 2 mm broad line with up to 10 scars of vascular bundles, for $^1/_2$ semi-lunular with rounded edges, with ca 17 leaf-traces in central part, leaving free margin of ca $1^1/_2$ mm breadth. *Leaves* oblong to oblanceolate, (20—)25—70(—100) × (6—)8—25(—35) cm, with (18—)25—35(—40) nerves on either side; acute, often slightly acuminate with up to 1 cm long acumen at apex, rounded at base, shortly decurrent, not connected with petiolar wings; margin manifestly dentate, nerves very slightly curving upward, ending in apex of teeth; slightly shining above, dull beneath, glabrous on both sides. Petiole $2^1/_2$—5(—$7^1/_2$) cm, glabrous above, glabrous to slightly hirsute beneath, with amplexicaul wings; wings obovate, $2^1/_2$—5(—10) cm long, $1^1/_2$—3(—6) cm broad, rounded at apex, glabrous above, glabrous to densely hirsute beneath, wholly caducous. *Flowers* solitary, terminal, ca 20 cm across. Pedicel 4—8(—12?) cm long, 3—5 mm thick, slightly thickened to 5—6 mm at apex, glabrous to densely hirsute like younger branches, without bracteoles. Sepals 5(—6), yellowish green, oval, 3 outermost ones ca 25 × 20 mm, 2(—3) innermost ones ca 40 × 30 mm, glabrous on both sides, ciliate at margin. Petals 5, yellow, elliptic-obovate, $9^1/_2$—$10^1/_2$ × 7—8 cm, rounded at apex. Stamens in 2 distinct groups, those of outer group (ca 600) slightly curved in bud, 10—12 mm long, those of inner group (ca 100) with apical part reflexed outward in bud, 17—25 mm long; outside outer stamens ca 15 filamentous staminodes, 6—14 mm long; filament of stamens of outer group 3—5 mm long, 0.3—0.4 mm broad, of those of inner group 5—12 mm long, 0.5—0.8 mm broad; anther 0.7—0.8 mm broad, rounded to (rarely) manifestly acuminate at apex; thecae linear, opening with pore near apex, in stamens of outer group on inner side, in those of inner group on outer side. Carpels ca 14—16, arranged around rather broad conical receptacle, lanceolate, ca 10 × 3 mm, glabrous, each with ca 25 ovules; styles spreading, flattened, ca 22 mm long, ca 0.9—1.2 mm broad at base, 0.3 mm near apex. *Pseudocarps* indehiscent, about globular, ca 5 (—$7^1/_2$?) cm diam. including enclosing sepals which are ca 7 × 5 cm, at base up to ca 8 mm thick; carpels ca 25 × 11 mm, each with 0—1 seed. Seeds obovoid, ca 6 × 4 mm, dark brown, dull, finely shortly echinate, enclosed by 8 mm long membranous aril.

Philippines: *Vidal 2025*, fl. (K); *Curran FB 10712*, June 1908 (US). — Luzon: Zucban, Tayabas Prov., *Vidal 941*, fr. (FI, K, L); Sorsogon, Albay Prov., *Vidal 2024*, fl. (K); Quinatacutan, Tayabas Prov., *Foxworthy & Ramos BS 13167*, fr. March 1911 (BM, US); Bulusan Volcano, Sorsogon Prov., *Ramos BS 23685*, fr. Sept. 1915 (A, BM, P, US); Irosin (Mt Bulusan), Sorsogon Prov., *Elmer 15408*, fr. Dec. 1915 (A, BM, BZ, C, CAL, FI, G, GH, K, L, MO, NY, P, S, U, UC, US); Mt Tulaog, Tayabas Prov., *Ramos & Edaño BS 29145*, fr. May 1917 (BZ, MO, US); Umiray, Tayabas Prov., *Ramos & Edaño BS 28959*, fl. & fr. May—June 1917 (A, US). — Samar: *Ramos BS 17581*, fl. March—Apr. 1914 (BM, K, P, US); Catubig Riv., *Ramos BS 24483*, fr. Feb.—March 1916 (K, P, US); Sitio Kansulaban, *Concord, Sulit, & Colcse PNH 6377*, fl. May 1948 (A). — Mindanao: Todaya (Mt Apo), Davao Distr., *Elmer 11883*, fr. Sept. 1909 (A, BM, BZ, CAL, E, FI, G, K, L, MO, NY, US); Zamboanga Distr., *Merrill BS 8062*, fr. Nov.—Dec. 1911 (P); Cabadbaran (Mt Urdaneta), Agusan Prov., *Elmer 13888*, fr. Sept. 1912 (A, BM, BZ, CAL, E, FI, G, GH, K, L, NY, U, UC, US); Mt Tubuan, Zamboanga Distr., *Ramos & Edaño BS 36629*, fr. Oct. 1919 (A, BM, P); Malangas, Zamboanga Distr., *Ramos & Edaño BS 37254*, fr. Oct.—Nov. 1919 (BRI, GH); ibidem, *Ramos & Edaño BS 37445*, Oct.—Nov. 1919 (K, P); Dinagat, Surigao, *Ramos & Convocar BS 84085*, fr. May 1931 (NY); Mt Kabatuan, Surigao Prov., *Mendoza & Convocar PNH 10316*, fl. March 1949 (A).

Distribution. Philippines; Luzon, Samar, and Mindanao.

Ecology. In primary forests, up to 1000 m altitude, often on riverbanks.

Vernacular names. *Kalambóg* (Bag.), *Katmón* (Bag., Bik., S. L. Bis.), *Katmón-bayani* (Tag.), *Lumbóg* (Sub.), *Paláli* (Sub.).

Uses. The fruit is eaten.

27. Dillenia philippinensis Rolfe 1884

Catmon Kamel, Descr. Frut. et Arb. Luz., 1704, p. 56.

Dillenia indica Auct. non L.; Blanco, Fl. Filip., 1837, p. 472; Villar, Nov. App., 1880, p. 3.

Dillenia speciosa Auct. non Thunb.; Blanco, Fl. Filip. ed. 2, 1845, p. 329 & **ed. 3, 2, 1878, p. 244, Atl. t. 199.

Dillenia philippinensis Rolfe, J. Linn. Soc. Bot. 21, 1884, p. 307; Vidal, Rev. Pl. Vasc. Filip., 1886, p. 37; Merr., Govt Lab. Publ. Philip. 27, 1905, p. 15; Merr., Fl. Manila, 1912, p. 331; *Wester, Philip. Agric. Rev. 8, 1915, p. 104, t. 7a (photo of fruit); Merr., Sp. Blanc., 1918, p. 263; *Brown, Minor Prod. Philip. For. 2, 1921, p. 338, f. 62, 63 & 3, 1921, p. 212; Merr., En. Philip. Fl. Pl. 3, 1923, p. 61; Quisumb., Medic. Pl. Philip., 1951, p. 613; Hoogl., Fl. Mal. I, 4, 1951, p. 164.

Dillenia catmon Elm., Leafl. Philip. Bot. 7, 1915, p. 2610; Merr., En. Philip. Fl. Pl. 3, 1923, p. 59.

Type specimens: *Dillenia philippinensis:* Vidal 4, Prov. Ilo-ilo, Panay Isl.; holotype in K (indicated as type by Rolfe in herb.), isotypes in FI, L. — *Dillenia catmon:* Elmer 13564, Cabadbaran (Mt Urdaneta), Agusan Prov., Mindanao, Aug. 1912; isotypes in A, BM, BZ, C, CAL, E, FI, G, GH, K, L, MO, NY, P, U, US.

Evergreen trees, up to 17 m high, 60 cm thick, with rather lowly attached crown. Bark reddish brown, peeling off in thin irregular plates; heartwood nearly incarnate to very dark, nearly black in centre. Branches sympodial, younger ones 2—$2^1/_2$ mm thick, glabrous to hirsute with $1^1/_2$—2 mm long hairs or rather densely shortly hirsute with 0.2—0.6 mm long hairs, most densely so above leaf-scars, glabrescent. Leaf-scars amplexicaul, for about $^2/_3$ single line, for $^1/_3$ semi-lunular to rounded-triangular with ca 7 leaf-traces in lower half parallel to lower margin and ca 3 in upper half. *Leaves* chartaceous, ovate or elliptic to oblong or lanceolate, ($6^1/_2$—)10—16(—27) × (5—)7—12(—17) cm, with (8—)10—15(—18) nerves on either side; rounded to obtuse, often slightly acuminate at apex, rounded to obtuse at base, sharply separated from petiolar wings; margin slightly dentate or undulate, nerves ending in apex of teeth or otherwise in margin; rather dull, dark green, glabrous or sparsely shortly hirsute, most densely so on midrib, above, dull, much lighter green, glabrous or sparsely shortly hirsute on intervenium, glabrous to sparsely hirsute or rather densely shortly hirsute on nerves and midrib beneath. Petiole $3^1/_2$—5 cm, glabrous above, glabrous to hirsute or rather densely shortly hirsute beneath, with amplexicaul wings; wings half-elliptic to half-oblong, 3—12 mm broad, with rounded apex and base and entire margin, at apex not or, rarely, slightly exceeding its insertion to petiole, glabrous above, glabrous to hirsute or shortly hirsute beneath, wholly caducous. *Inflorescences* terminal, 1—2(—3)-flowered racemes, 5—15 cm long; axis 3—4 mm thick, glabrous to hirsute or shortly hirsute like younger branches, often ending with short (up to 3 mm long) sterile apex, without bracts. *Flowers* 10—$12^1/_2$ cm across. Pedicel $^1/_2$—4 cm, 2—3 mm thick, thickened to 3—4 mm at apex, glabrous to hirsute or shortly hirsute like axis of inflorescence, without bracteoles or with a small leaflet just below flower; leaflet ca 10 × 4 mm with 4 mm long petiole or up to twice as large. Sepals 5, circular to elliptic, 2 outermost ones slightly smaller and relatively broader (ca 18 × 18 mm) than 3 innermost ones (ca 20—25 × 17—20 mm), glabrous inside, glabrous to densely hirsute or shortly hirsute outside, sparsely ciliate at margin. Petals 5, white, obovate, ca 60 × 40 mm, rounded at apex, narrowed towards base. Stamens in 2 distinct groups, those of outer group (ca 230) yellowish white, slightly curved in bud, ca 11 mm long, those of inner group (ca 40) purplish, with apical part reflexed outward in bud, ca 15—23 mm long, in general thicker than those of outer group; filament $2^{1}/_{2}$—5 mm long, ca 0.5 mm broad; anther ca 0.8 mm broad, obtusely acuminate at apex; thecae linear, opening with apical pore. Carpels 10—12, arranged around narrow conical receptacle, lanceolate, ca 7—9 × $2^{1}/_{2}$—3 mm, glabrous, each with 10—12 ovules; styles spreading, linear, ca 17 mm long, 0.6 mm broad near base, acute at apex. *Pseudocarps* indehiscent, depressed-globose, ca 5—6 cm diam., 4—5 cm high including enclosing sepals, which are only slightly fleshy; carpels slightly spirally twisted, fleshy, ca 20 × 13 mm, 0—4-seeded. Seeds obovoid, ca 5 × 3 mm, black, very finely echinate, at base enclosed by appressed, ca 2 mm long membranous aril.

var. philippinensis

Synonyms same as for the species.

Indument generally sparse or absent.

Philippines: Mindoro: Baco, *Merrill 1185*, fr. Jan. 1903 (US); Pola, *Merrill 2206*, fl. March 1903 (K, NY, US); Abonabon, *Merrill 2182*, fl. May 1903 (K, US); Baco Riv., *McGregor 147*, fl. March—Apr. 1905 (K, NY, US); *Merritt FB 9687*, fr. Feb.—Apr. 1908 (SING); *Lambert & Brunson 39*, fl. 1945 (US). — Babuyan Isls: Camiguin Isl., *Fénix BS 4146*, fr. June—July 1907 (NY). — Luzon: *Poivre (Herb. Jussieu)*, fl. (P); Manila, *Gaudichaud 283*, fl. Nov. 1836 (P); ibidem, *Gaudichaud*, Dec. 1836 (G); Albay Prov., *Cuming 930*, fl. (FI); *Lobb*, fl. (K); Sorsogon, Albay Prov., *Vidal 2022*, fl. (K); ibidem, *Vidal 2023*, fl. (K); Morong Distr., *Vidal 2036*, fl. (K); Mt Isarag, S. Camarines Prov., *Vidal 2037*, fl. (K); Sitio Munang, Morong Prov., *Loher 16*, fl. (CAL, K, US); Rio Puray, Manila, *Loher 18*, fr. Dec. 1890 (K); Rio Puray, Montalban, *Loher 19*, fl. May 1891 (K); Bosoboso, Morong Prov., *Loher 17*, fl. Oct. 1891 (K); Pasacao, S. Camarines Prov., *Ahern 54*, fl. (BZ, NY, US); Mariveles, *Ahern 78*, fr. (NY); ibidem, *Ahern 781*, fl. Jan. 1902 (BZ, CAL, NY, US); Baler, Principe Prov., *Merrill 1002*, Aug. 1902 (K, NY, US); Antipolo, Rizal Prov., *Merrill 1656*, fl. March 1903 (K, NY, US); Pagbalao, Tayabas Prov., *Merrill 1918*, fl. Apr. 1903 (K, US); Bosoboso, Rizal Prov., *Merrill 2827*, fl. July 1903 (BM, US); Lagumanoc, Tayabas Prov., *Ware FB 20*, Sept. 1903 (NY, US); Botolan, Zambales Prov., *Merrill 2947*, fl. Nov. 1903 (BM, K, NY, US); Lamao Riv., Mt Mariveles, Bataan Prov., *Williams 658*, fr. March 1904 (K, NY, US); Sablan, Benguet Prov., *Elmer 6127*, fl. Apr. 1904 (G, K, NY, P, US); Antipolo, Rizal Prov., *Ahern's Coll. 101*, fl. May 1904 (US); Lamao Riv., Mt Mariveles, Bataan Prov., *Borden FB 1259*, June 1904 (BM, BZ, K, NY, SING, US); Antimonan, Tayabas Prov., *Whitford 646*, fl. Aug.—Sept. 1904 (K, P, US); Sablan, Benguet Prov., *Williams 2003*, fl. Nov. 1904 (NY, US); Rizal Prov., *Ahern's Coll. FB 2973*, fl. Apr. 1905 (BZ, K, NY, SING, US); Rizal Prov., *Foxworthy BS 102*, fl. & fr. Jan. 1906 (BZ, MO, NY, US); Cavinti, Laguna, *Loher 6765*, fl. Feb. 1906 (K, M); Sorsogon Prov., *Bridges FB 5163*, fr. Aug. 1906 (SING); Baguio, Benguet Prov., *Elmer 8927*, fl. March 1907 (BZ, E, FI, G, K, L, NY); Cavite & Batangas Provs, *Curran FB 7685*, fr. Oct. 1907 (MO, P); Pangasinan Prov., *Ramos 4958*, fr. Dec. 1907 (GH); Mauban, Tayabas Prov., *Curran FB 10192*, fr. March 1908 (BZ); Tayabas Prov., *Curran FB 10755*, fl. March 1908 (BZ, CAL, L); Cagayan Prov., *Darling FB 14815*, fr. March 1909 (BM); Cagayan Prov., *Klemme FB 18617*, fl. Apr. 1909 (CAL); Laguna Prov., *Curran FB 19283*, fl. Feb. 1910 (L, P); Laguna Prov., *Bartolomé 69*, fl. Apr. 1910 (MICH); Sablang, Benguet Prov., *Fénix BS 12645*, fl. & fr. Nov.—Dec. 1910 (BZ, L, P); Nueva Ecija Prov., *Alvarez FB 22169*, fl. Dec. 1910 (CAL); Rizal Prov., *Ramos 1082*, fr. Aug. 1911 (FI, G, M, U, US); Cagayan Prov., *Wood FB 12997*, fl. Jan. 1912 (BM, K, US); Mt Oriud, Montalban, Rizal Prov., *Loher*, fl. Apr. 1912 (UC); Mt Maquiling, Laguna Prov., *Serviñas BS 16921*, Nov. 1912 (BRI, US); ibidem, *Cenabre*, fl. March 1913 (MICH); Antipolo, Rizal prov., *Ramos (Merrill, Species Blancoanae) 598*, fr. Jan. 1914 (A, BM, BZ, CAL, GH, K, L, MO, NY, P); Mt Maquiling, Laguna Prov., *Quisumbing 7970*, fl. Feb. 1914 (MICH); Bataan Prov., *Diaz & Alambra BS 22812*, fr. Aug. 1914 (A, BZ, GH, US); Cagayan Prov., *Velasco FB 23289*, fr. Sept.—Oct. 1914 (A, BZ, CAL, SING); Tayabas Prov., *Manuel FB 23485*, fl. Jan. 1915 (US); Paningtingan, Rizal Prov., *Loher*, fl. March 1915 (UC); Irosin (Mt Bulusan), Sorsogon Prov., *Elmer 15041*, fr. Nov. 1915 (A, BM, BZ, C, CAL, G, GH, K, L, MO, NY, P, S, U, UC, US); Ilocos Norte Prov., *Paraiso FB 25081*, fr. Feb. 1916 (A); Burgos, Ilocos Norte Prov., *Ramos BS 27332*, fl. Feb.—March 1917 (A, BM, BRI); Apayao Subprov., *Fénix BS 28210*, fr. May 1917 (GH, MO, US); Los Baños, Mt Maquiling, Laguna Prov., *Elmer 17605*, fl. June—July 1917 (A, BM, BZ, C, CAL, FI, G, GH, K, L, MO, NY, P, S, U, UC, US); Mt San Isidro, Labrador, Pangasinan Prov., *Fénix BS 29999*, fl. Nov. 1917 (A, BM); Paracale, Camarines Prov., *Ramos & Edaño BS 33518*, fr. Nov.—Dec. 1918 (A, BM); ibidem, *Ramos & Edaño BS 33527*, fl. Nov.—Dec. 1918 (BZ, L); Zambales Prov., *Elgincolin FB 27839*, fr. Jan. 1920 (A, BM); Antipolo, Rizal Prov., *Ramos BS 42013*, fl. Feb. 1923 (A, BM, BRI, DD, G, MEL, SING, UC); Anuling, Zambales Prov., *Ramos & Edaño BS 44636*, fr. Dec. 1924 (DD, UC); Kulap Riv., Casiguran, Tayabas Prov., *Ramos & Edaño BS 45486*, fl. June 1925 (C, UC); Sa Lernando, La Union Prov., *Lete 86*, fr. Apr. 1927 (L); Sitis Melalinta, Mt Maquiling, Laguna Prov., *Sulit PNH 6978*, fl. Apr. 1947 (A); Cementi Riv., Baler, Tayabas, Quezon Prov., *Quisumbing PNH 2428*, fl. May 1947 (A); Mt Pinatubo-Villar, Zambales Prov., *Fox PNH 4766*, fl. Sept. 1948 (A); Mt Kaunayan, Baler, Quezon Prov., *Quisumbing PNH 8059*, fl. Feb. 1949 (A). — Polillo: Karlagan, NE. Polillo Isl., *Fox PNH 8966*, fl. (A). — Leyte: Palo, *Elmer 7149*, fl. Jan. 1906 (A, BZ, E, FI, G, K, NY); *Wenzel 402*, fl. Feb. 1916 (A, BM, GH, MO); *Wenzel 1685*, fl. March 1916 (A, BM, GH, MO). — Cebu: *Espinosa FB 6417*, fr. Sept. 1906 (MO). — Panay: Ilo-ilo Prov., *Vidal 4*, fl. (FI, K, L); Guimaras Isl., *Gamill FB 263*, fr. Jan. 1904 (BM, NY, US); Mt Timbaban, Capiz Prov., *Edaño BS 42382*, fl. & fr. May 1923 (SING); Agraman Riv., Capiz Prov., *Edaño BS 45980*, fl. Oct. 1925 (BM, UC). — Sulu Isls: Tawatawi, *Ramos & Edaño BS 44038*, fl. & fr. Aug. 1924 (NY, S, UC). — Basilan: *Hallier 4432*, fl. Jan. 1904 (L); *Hutchinson FB 6108*, fr. July—Aug. 1906 (BZ, SING); *Miranda FB 18972*, fl. Oct. 1912 (BM, K, P, SING, US). — Mindanao: Davao, *Montano 137*, Sept. 1880 (P); Simulao Riv., *Montano 206*, fl. Dec. 1880 (P); *Burke 1*, fl. 1882 (K); *Ahern 308*, fr. (BZ, US); Sindangan Bay, *Mearns 199 & 200*, fl. Feb. 1904 (US); San Ramon, Zamboanga Prov., *Hallier 4432b*, fl. Feb. 1904 (L, NY); Davao, Davao Distr., *Copeland 508*, fr. March 1904 (US); Sax Riv., Zamboanga Prov., *Williams 2309*, fl. Feb. 1905 (GH, K, NY, US); Santa Cruz, Davao Prov., *Williams 2906*, fl. & fr. June 1905 (NY, US); Surigao Prov., *Bolster 400*, fl. Sept. 1906 (UC); Todaya, Mt Apo, Davao Distr., *Elmer 10532*, fl. & fr. May 1909 (A, BM, BZ, E, FI, G, K, L, MO, NY, U, US); Surigao Prov., *Ramos & Pascasio BS 34770*, fl. June 1909 (A, P, UC); Dapitan, Misamis Prov., *Piper BS 79*, fl. Apr. 1911 (BM); Cabadbaran (Mt Urdaneta), Agusan Prov., *Elmer 13564*, fl. Aug. 1912 (A, BM, BZ, C, CAL, E, FI, G, GH, K, L, MO, NY, P, U, US); Misamis Prov., *Miranda FB 17961*, fr. Jan.—Febr. 1913 (US); Mahilucot Riv., Bukidnon Subprov., *Ramos & Edaño BS 38653*, fr. June—July 1920 (A); Davao Prov., *Elumir FB 28257*, fr. Nov. 1920 (BM); Mt Apo, Davao Prov., *Clemens BS 15744*, fl. June 1924 (UC); Mainit Lake, Surigao Prov., *Wenzel 2640*, fl. May 1927 (A, BZ, G, GH, K, M, MO, UC); ibidem, *Ramos & Concovar BS 83388*, fl. March—Apr. 1931 (NY); Catalnan, Davao, *Kanehira 2493*, fr. (NY); near Malabang, Lanao Prov., *Lynn Zwickey 128*, fl. Sept. 1938 (A); Mt Katanglad, Bukidnon Prov., *Sulit PNH 10103*, fl. & fr. March 1949 (A).

Cultivated: Serdang Exper. Stat., Selangor (from Manila): *Brown*, fr. Sept. 1939 (SING); *Brown*, fl. Feb. 1940 (SING).

var. pubifolia Merr. 1923

Dillenia philippinensis var. pubifolia Merr., En. Philip. Fl. Pl. 3, 1923, p. 61.

Type specimen: I have seen none of the specimens cited by Merr., probably all are lost; Siriban FB 30393, San Mariano, Isabella Prov., Luzon, Apr. 1926; neoholotype in NY, isotype in BM, K, UC, US.

Differs from *var. philippinensis* by short-hirsute indument on younger branches, lower side of leaves and petioles, axes of inflorescences, pedicels, and outer side of sepals.

Philippines: Luzon: Cagayan Prov., *Bernardo FB 15206*, fl. May—June 1912 (P); San Mariano, Isabella Prov., *Siriban FB 30393*, fl. Apr. 1926 (BM, K, NY, UC, US); Penablanca, Cagayan Prov., *Ramos & Edaño BS 46530*, fr. Apr. 1926 (NY, UC). — Mindanao: Surigao Prov., *Ahern*, fr. 1901 (US); Malangas, Zamboanga Distr., *Ramos & Edaño BS 36824*, fr. Oct.—Nov. 1919 (SING).

Distribution. Philippines, found in most islands from the Babuyan Islands to the Sulu Islands; not found in Palawan and the Calamianes. *Var. pubifolia* is known only from Luzon and Mindanao.

Ecology. Common in forests at low and medium altitudes, rarely up to 1800 m (*Sulit PNH 10103*) & 2000 m (*Bartolomé 69*).

Vernacular names. *Balale* (Ibn.), *Bihis* (Ig.), *Biskan* (Ig.), *Bolobayáuak* (P. Bis.), *Cachuchio* (C. Bis.), *Dingin* (Sbl.), *Kalambúgui* (Lan.), *Kambúg* (Sul.); *Katmón* (Tag., Pamp., Bis., Bik., Mbo., Sul., Mag.), *Kalambók* (Bag.), *Kulambúg* (Bag., Buk.), *Ngingir* (Lan.), *Palagao* (Klg.), *Paláli* (Ilk., Ibn., Sub., Pang., Tag.), *Palále* (Ibn.), *Pamamalien* (Pang.).

Uses. The fruit is eaten fresh; the taste is not particularly good but owing to its acid juicy character it is refreshing. An excellent sauce or jam is made from it and it is also used for flavoring fish. A red dye is obtained from the bark. The acid juice of the fruit, mixed with sugar, is used as a cough cure; it is also used for cleansing the hair.

Notes. 1. The differences between the varieties are only very slight; as I have seen no intermediates, I have retained them.

2. *Dillenia catmon* differs from the typical form by the more dense indument on the outer side of the sepals. As to this character I have seen intermediate forms; I do not think, therefore, that it should be retained, not even as a variety.

28. Dillenia marsupialis Hoogl. spec. nov.

Dillenia ochreata Auct. non (Miq.) Teysm. & Binn. ex Martelli; Merr., En. Philip. Fl. Pl. 3, 1923, p. 61.

Dillenia marsupialis Hoogl., Fl. Mal. I, 4, 1951, p. 162, descr. angl..

Type specimen: Ramos & Edaño BS 75247, Catanduanes, 10 Nov. 1928; holotype in NY, isotypes in CAL, SING, UC.

Descriptio typi: Rami novelli glabri; cicatrices amplexicaules. Folia elliptico-oblonga, $12^{1}/_{2}$—19 × $5^{1}/_{2}$—9 cm, 13—16-nervata, apice acuminata, basi acuta decurrente, margine plus minusve undulata; glabra. Petiolus 2—4 cm, glaber, alis amplexicaulibus suborbicularibus caducis. Flores solitarii, terminales, pedicello 3—$4^{1}/_{2}$ cm, unibracteolato; bracteola ca $^{1}/_{2}$ cm infra florem inserta, linearis, ca 20 mm longa, 2 mm lata. Specimen typicum in fructu tantum. Fructus indehiscens, ca 5 cm diametro. Sepala usque ad 8 cm longa, 5 cm lata. Stamina exteriora ca 10 mm, interiora ca 20 mm longa, non longitudinis intermediae. Carpella ca 25 mm longa, 12 mm lata, ca 10-ovulata, 1—2-seminata. Semina reniformia, ca 6 × 4 mm, arillo membranaceo ca 6 mm longo.

Fig. 8 e, p. 67.

Small evergreen trees. Branches sympodial, younger ones ca 3 mm thick, glabrous, sometimes hirsute immediately above leaf-scar. Leaf-scars amplexicaul, for about $^{3}/_{5}$ single line, for $^{2}/_{5}$ rounded-triangular with ca 11 leaf-traces, partly along line slightly above lower margin, partly about centre of scar. *Leaves* elliptic to oblong, (8—)12—20(—28) × ($4^{1}/_{2}$—)$5^{1}/_{2}$—10(—$12^{1}/_{2}$) cm, with (10—)13—16(—18) nerves on either side; rounded or obtuse, more or less distinctly acuminate at apex, obtuse to acute at base; margin nearly entire to distinctly dentate, nerves slightly curving upward, ending in apex of teeth, sometimes between 2 nerves one distinct near midrib, gradually disappearing into venation; glabrous. Petiole $1^{1}/_{2}$—4 cm, glabrous, with amplexicaul wings; wings nearly circular to obovate, cohering with petiole for $^{1}/_{3}$ of length of

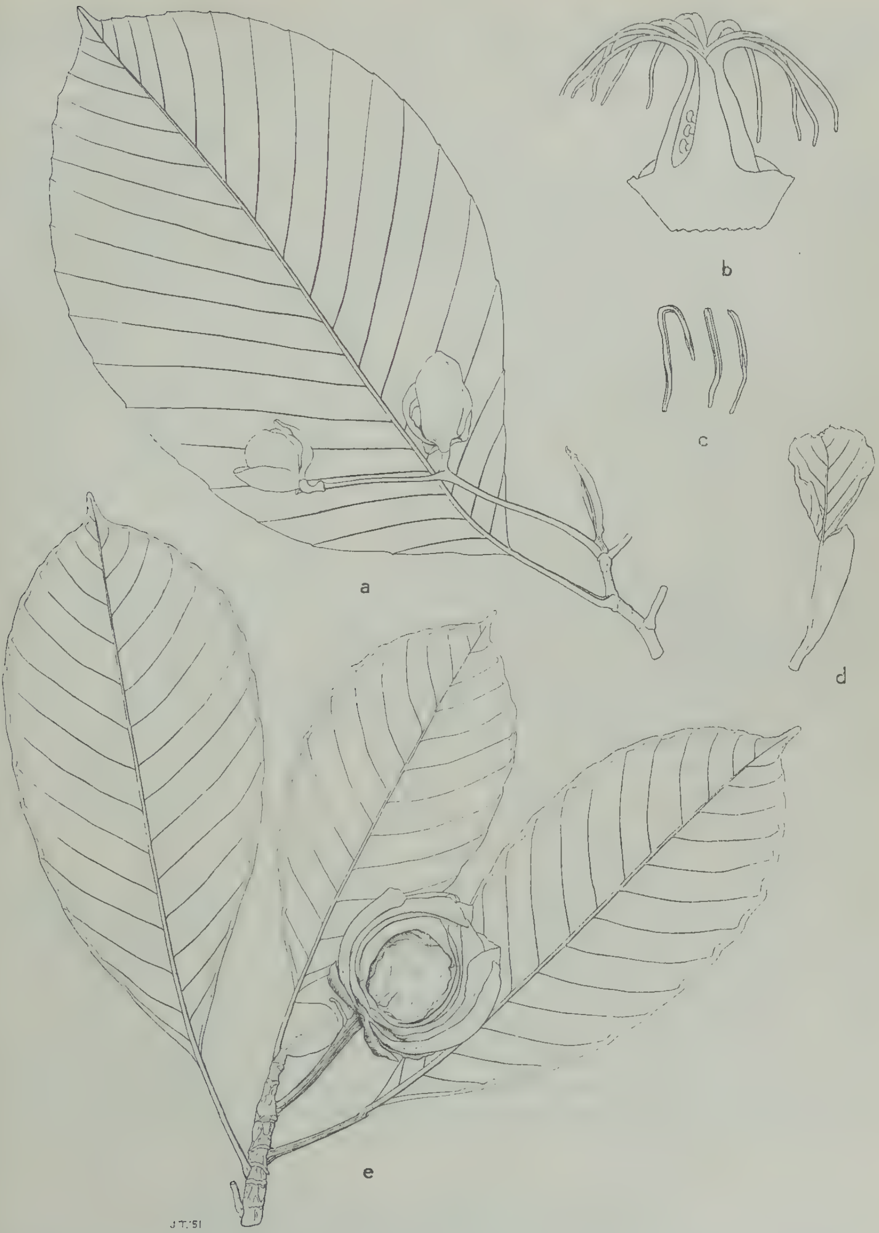


Fig. 8 — a, b, c, d. *Dillenia talaudensis* Hoogl. (p. 59); a. branch with young infrutescence, × $^{2}/_{5}$; b. gynoecium, longitudinal section, from a rather old bud, × $2^{1}/_{2}$; c. stamens from a rather old bud, × $2^{1}/_{2}$; d. young leaf with the petiolar wings still present, × $^{2}/_{5}$; all after type specimen; e. *Dillenia marsupialis* Hoogl. (p. 66), fruiting branch with fruit in longitudinal section, × $^{2}/_{5}$; after type specimen.

latter, up to 35 mm long, 22 mm broad, with rounded apex and entire margin, wholly caducous. *Flowers* solitary, terminal, ca 10 cm across (estimated). Pedicel (2—)4—6(—8) cm, 3—5 mm thick, glabrous, often with single bracteole $^{1}/_{2}$—1 cm below flower; bracteole linear-lanceolate to spathulate, 5—20 mm long, 2—5 mm broad. Sepals 8—9, not much different in size, ovate, $3^{1}/_{2}$—$4 \times 2^{1}/_{2}$—3 cm, glabrous on both sides, not ciliate at margin. Petals unknown. Stamens in 2 distinct groups, those of outer group (ca 260) slightly curved in bud, ca 13 mm long, those of inner group (ca 75) with apical part reflexed outward in bud, ca 23 mm long; filament 4—9 mm long, 0.4—0.5 mm broad, in stamens of outer group flattened, in those of inner group rather thick; anther ca 0.8—1.0 mm broad, mucronate at apex; thecae linear, opening with pore near apex on outer side. Carpels ca 15, arranged around narrow conical receptacle, lanceolate, ca 12 × 2 mm, glabrous, each with 7—10 ovules; styles recurved, cylindric, ca 20 mm long, near base ca 1 mm thick, near apex ca 0.2 mm, slightly channelled above. *Pseudocarps* indehiscent, subglobose, slightly flattened, 4—5 cm diam., $3^{1}/_{2}$—$4^{1}/_{2}$ cm high including enclosing sepals which are up to 8 × 5 cm; carpels fleshy, ca 25 × 12 mm, 1—2-seeded. Seeds reniform, ca 6 × 4 mm, enclosed by 6 mm long, membranous aril.

Philippines: Luzon: S. Camarines Prov., *Vidal 2038*, fr. (K); Cagayan Prov., *Curran FB 17190*, fl. March 1902 (US); Montalban, Rizal Prov., *Loher BS 12069*, fl. Oct. 1909 (UC); Camarines Prov., *Darling FB 18740*, fl. Apr. 1910 (US); Lucban, Mt Banajao, Tayabas Prov., *Ramos BS 19512*, fr. Jan. 1913 (K, US); Caraballo Mtn, Nueva Vizcaya Prov., *Loher BS 13749*, March 1915 (UC); Tayabas Prov., *Calliran FB 25661*, June 1916 (US); Mt Palimlim, Ilocos Norte Prov., *Ramos BS 33300*, fr. Aug. 1918 (A, K, P, US). — Catanduanes: *Ramos BS 30344*, Nov.—Dec. 1917 (K, NY, P, US); Mt Abucay, *Ramos & Edaño BS 75247*, fr. Sept. 1928 (CAL, NY, SING, UC). — Panay: Libacao, Capiz Prov., *Martelino & Edaño BS 35444*, June—July 1919 (A, P).

Distribution. Philippines, known from Luzon, Catanduanes, and Panay only.

Ecology. In forests, up to 1200 m altitude.

Notes. 1. The species in shape of the leaf and of the petiolar wings closely resembles *D. ochreata* from N. Celebes, though the leaves are generally larger than in that species. The flowers and fruits are also distinctly larger, whereas the most striking difference is found in the larger number of sepals in the present species.

2. The specific epithet *marsupialis*, derived from *marsupium* = pouch, has been chosen for the species in view of the structure and shape of the petiolar wings. Rumphius already compared the petiolar wings in *D. serrata* with a pouch ("bursa") for the peculiar way in which the terminal bud is enclosed.

29. Dillenia reifferscheidia Villar 1880

Reifferscheidia speciosa *Presl, Rel. Haenk. 2, 1836, p. 74, t. 62.

Dillenia reifferscheidia Villar, Nov. App., 1880, p. 3, based on *Reifferscheidia speciosa* Presl; **Blanco, Fl. Filip. ed. 3, 1880, t. 344; Vidal, Rev. Pl. Vasc. Filip., 1886, p. 38; Brown, Minor Prod. Philip. For. 2, 1921, p. 339; Merr., En. Philip. Fl. Pl. 3, 1923, p. 61; Hoogl., Fl. Mal. I, 4, 1951, p. 162.

Dillenia speciosa (Presl) Gilg in Engl. & Prantl, Nat. Pfl. Fam. 3, 6, 1893, p. 124; non Thunb. 1791.

Dillenia reifferscheidia var. rosea Elm., Leafl. Philip. Bot. 8, 1919, p. 3079.

Type specimens: *Reifferscheidia speciosa:* Haenke, near Sorsogon, Luzon; in herb. Prague; not seen. — *Dillenia reifferscheidia var. rosea:* Elmer 18025, Los Baños (Mt Maquiling), Prov. Laguna, Luzon, June—July 1917; isotypes in A, C, CAL, FI, G, GH, K, L, MO, NY, P, S, U, UC, US.

Evergreen trees, up to ca 12 m high, 60 cm thick, with widely spreading branches which are crookedly rebranched. Branches sympodial, younger ones 0.8—1.0 mm thick, shortly villose, glabrescent. Leaf-scars amplexicaul, for about $^{1}/_{3}$ single line, for $^{2}/_{3}$ broadly triangular with rounded apex, with ca 11 leaf-traces in lower part. *Leaves* elliptic or broadly to narrowly obovate, (12—)20—30(—50) × (8—)13—20(—35) cm, with ca 14—20 nerves on either side; rounded to obtuse, sometimes shortly acuminate at apex, rounded at base, not connected with petiolar wings; margin dentate to nearly entire, nerves rather straight, ending in apex of teeth; shining, glabrous above, dull, glabrous on intervenium, strigose on nerves and midrib beneath. Petiole 3—4 cm, glabrous above, strigose beneath, with amplexicaul wings; wings obovate, 3—4(—5) × $2^{1}/_{2}$—3(—4) cm, glabrous above, more or less densely villose beneath, rounded at apex, with entire margin, wholly caducous. *Flowers* terminal, solitary or two, rarely three, together, ca $17^{1}/_{2}$ cm across. Pedicel 3—10 cm, 5—7 cm thick, glabrous to hirsute, most densely so just below flower, without or with 2—5 verticillate bracteoles; if solitary, without or with bracteoles, if 2(—3) together, 1(—2) with and 1 without bracteoles; bracteoles sessile, ovate to lanceolate, $2^{1}/_{2}$—5 × $1^{1}/_{2}$—1 cm, nearly obtuse to acute at apex, with broad to rather narrow, almost petiole-like base, glabrous above, hirsute beneath. Sepals 11—17, increasing in size towards centre of flower, outermost ones about circular, ca 20 × 22 mm, innermost ones elliptic, ca 65 × 40 mm, glabrous inside, sparsely hirsute, particularly on outermost sepals and margins of innermore ones outside, ciliate at margin. Petals 5, white or, rarely, rose red, obovate, 6—9 × 3—5 cm, rounded at apex, narrowed towards base. Stamens pale white or yellowish tinged, in 2 distinct groups, those of outer group (ca 375) slightly curved in bud, ca 11 mm long, those of inner group (ca 60) with apical part reflexed outward in bud, ca 25 mm long; filament flattened, ca 1 mm long, 0.3 mm broad; anther ca 0.8 mm broad, shortly acuminate at apex; thecae linear, opening with pore near apex on outer side. Carpels ca 15, arranged around conical receptacle, lanceolate, ca 12 × 3 mm, glabrous, each with 9—12 ovules; styles recurved, cylindric, ca 18 mm long, at base up to $1^{1}/_{2}$ mm, near apex ca 0.2 mm thick. *Pseudocarps* indehiscent, subglobose, 5—8 cm diam. including enclosing fleshy sepals; carpels fleshy, 20—25 × 10—12 mm, 1—4-seeded. Seeds obovate, ca 5 × 4 mm, black, enclosed by 9 mm long membranous aril.

Philippines. Luzon: Albay Prov., *Cuming 930*, fl. 1841 (BM, CGE, G, K, MEL, OX, P); Tayabas Prov., *Curran FB 10405*, fl. May 1908 (NY, US); Albay — Sorsogon, *Curran FB 10608*, fl. June 1908 (K, US); Cagayan Prov., *Curran FB 17196*, March 1909 (US); Rizal Prov., *Ramos BS 13627*, fr. Aug. 1911 (BM, BZ, CAL, E, K, L, P, US); Mt Maquiling, Laguna Prov., *Villamil FB 23345*, fr. Nov.—Dec. 1914 (A, US); Sorsogon Prov., *Ramos BS 23354*, fl. & fr. July—Aug. 1915 (A, BM, BRI, BZ, CAL, GH, K, L, MO, NY, P, SING, US); San Antonio, Laguna Prov., *Ramos BS 23807*, fl. Oct. 1915 (A, P, US); Irosin, Mt Bulusan, Sorsogon Prov., *Elmer 15619*, Dec. 1915 (A, BM, BZ, CAL, G, GH, K, L, MO, NY, P, UC, US); Mt Tulaog, Tayabas Prov., *Ramos & Edaño BS 29122,* fr. May 1917 (A, US); Los Baños, Mt Maquiling, Laguna Prov., *Elmer 18025*, fr. June—July 1917 (A, C, CAL, FI, G, GH, K, L, MO, NY, P, S, U, UC, US); ibidem, *Elmer 18045*, fr. June—July 1917 (A, BM, BZ, C, CAL, FI, G, GH, K, L, MO, NY, P, S, U, UC, US); Makiling Nat. Park, Laguna Prov., *Sulit PNH 8209*, fl. May 1947 (A); Bulusan Water Lake, Mt Bulusan, Sorsogon Prov., *Sulit PNH 3660,* fl. July 1947 (A). — Catanduanes: *Ramos BS 30497,* fr. Nov.—Dec. 1917 (A, US); Mt Pagmasuso, *Ramos & Edaño BS 75107*, fr. July—Sept. 1928 (CAL, NY, SING). — Negros: *Tarrosa FB 15165,* Sept. 1909 (K); Mt Canlaon, *Curran FB 17405*, fl. Sept. 1909 (US). — Panay: Leon, *Vidal 2039* (K); Agsabay, Capiz Prov., *Edaño BS 46097*, fr. Nov. 1925 (NY, UC); Pilar, Capiz Prov., S. slope Upao Mtn, *Paniza PNH 9407*, fr. July 1947 (A). — Mindanao: Mt Mayo, Davao Prov., *Ramos & Edaño BS 49429,* fl. & fr. May 1927 (SING, UC); Tubud Placer, Surigao, *Wenzel 3 M*, fr. June 1927 (UC).

Distribution. Philippines, from Luzon to Mindanao.

Ecology. In primary and secondary forests, up to 1000 m altitude, particularly in the more humid regions.

Vernacular names. *Baláli* (Bik.), *Katmón* (Tag., P. Bis.), *Katmón kadlagan* (Bik.), *Katmón kalabáu* (Tag.), *Paláli* (Bik.).

Uses. The fruit makes a good preserve.

Note. *D. reifferscheidia var. rosea* is characterized only by the colour of the petals, these being rose red in this variety, white in *var. reifferscheidia*; the type specimen of *var. rosea* was collected in a forest where the other trees all had white flowers. The latter seems to be the usual state of the species. As it is impossible to distinguish the variety in dried specimens, I have taken in this treatment *var. rosea* together with *var. reifferscheidia.*

30. Dillenia suffruticosa (Griff. 1854) Martelli 1886

Wormia suffruticosa Griff., Not. 4, 1854, p. 706 & *Ic. Pl. As., 1854, t. 649; Hook.f. & Thoms., Fl. Br. Ind. 1, 1872, p. 35; Villar, Nov. App., 1880, p. 347; King, J. As. Soc. Beng. 58, II, 1889, p. 364; Ridl, J. Str. Br. R. A. S. 54, 1910, p. 5; Back., Schoolfl. Java, 1911, p. 10; Koord., Exk. Fl. Java 2, 1912, p. 601; **Blaauw, Trop. nat. in schetsen en kleuren, 1913, p. 17, t. 12; Ridl., Fl. Mal. Pen. 1, 1922, p. 8; Burk., Dict. Econ. Prod. Mal. Pen., 1935, p. 2265; Corn., Gard. Bull. S. S. 10, 1939, p. 9; *Corn., Wayside Trees Malaya, 1940, p. 207, pl. 53; Back., Bekn. Fl. Java (em. ed.) 4, 1942, fam. 80, p. 4.

Wormia excelsa Auct. non Jack; Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 67.

Wormia subsessilis Miq., Fl. Ind. Bat. Suppl., 1860, p. 619; Teysm. & Binn., J. Bot. Néerl. 1, 1861, p. 364; **Miq., Ann. Mus. Bot. Lugd. Bat. 1, 1864, p. 315, t. 9; Miq., Ann. Mus. Bot. Lugd. Bat. 4, 1868, p. 77; Ridl., J. Str. Br. R. A. S. 54, 1910, p. 4; Ridl., Saraw. Mus. J. 1, 1913, p. 71; *Ridl., Fl. Mal. Pen. 1, 1922, p. 7.

Wormia revoluta Teysm. & Binn., J. Bot. Néerl. 1, 1861, p. 364, in syn.

Wormia burbidgei **Hook.f., Bot. Mag., 1880, t. 6531.

Dillenia suffruticosa (Griff.) Martelli in Becc., Malesia 3, 1886, p. 163; Fin. & Gagnep., Bull. Soc. Bot. Fr. Mém. 4, 1906, p. 10; Merr., Bibl. En. Born. Pl., 1921, p. 384; de Wit, Bull. Bot. Gard. Btzg III, 18, 1949, p. 208; *Hoogl., Fl. Mal. I, 4, 1951, p. 162.

Dillenia burbidgei (Hook.f.) Gilg in Engl. & Prantl, Nat. Pfl. Fam. 3, 6, 1893, p. 123.

Wormia subsessilis var. borneensis Ridl., J. Str. Br. R. A. S. 54, 1910, p. 6.

Dillenia suffruticosa var. borneensis (Ridl.) Ridl., Saraw. Mus. J. 1, 1913, p. 71; Merr., Bibl. En. Born. Pl., 1921, p. 384.

Type specimens: *Wormia suffruticosa*: Griffith Kew Distr. 55, Malacca, 1845; holotype in K, isotypes in C, CGE, FI, GH, K, L, M, NY, P. — *Wormia subsessilis:* Teysmann 3203 HB, Banka; holotype in U, isotypes in BZ, CAL, K, L, MEL. — *Wormia burbidgei:* Burbidge, Borneo, 1877—8; holotype in K. — *Wormia subsessilis var. borneensis:* Hewitt, Kuching, 1909; holotype in SING, isotype in K.

Large shrubs or small trees, evergreen, up to 10 m high, with stout, brown trunk, often forming thickets. Branches sympodial, younger ones ca 3 mm thick, glabrous to densely villose with 2—3 mm long hairs, more or less glabrescent. Leaf-scars amplexicaul, for about $^1/_2$ single line, for $^1/_2$ subfalcate with ca 20 leaf-traces near lower margin. *Leaves* elliptic to ovate, (10—)15—25(—45) × (5—)8—12(—26) cm, with (7—)12—20 (—27) nerves on either side; rounded to obtuse at apex, obtuse at base, decurring into petiolar wings; margin entire to dentate or doubly dentate, nerves ending in apex of teeth, in larger leaves often 1—3 rather strong secondary nerves directed downward near margin, ending in apex of smaller teeth; glabrous, rarely slightly villose on intervenium in younger leaves only above, slightly to densely villose on nerves, on both sides along midrib (continuing on petiole), and along line which delimits bud-enclosing part of leaf-base beneath. Petiole 2—6 cm, with amplexicaul wings; wings 4—10(—15) mm broad, nervation of blade continuing, but less marked, on wings, wings and base of blade below line where both sides cohere in young leaf of different colour (darker when dry); wings usually persistent. *Inflorescences* terminal, (4—)6—10(—18)-flowered, up to 30 cm long, simple racemes or composed by having lateral branch at place of second, sometimes also third flower; axis ca 3 mm thick, glabrous to, particularly when young, densely villose; bracts caducous, triangular, 6—15 × 3—5 mm. *Flowers* 8—12 cm across. Pedicel 0.8—3 cm long, 2—3 mm thick, thickened to 3—4 mm at apex, without bracteoles. Sepals 5, obovate, 15—22 × 8—12 mm, glabrous inside, glabrous to rather densely villose outside. Petals 5, bright yellow, obovate, 40—50 × 25—30 mm, rounded at apex, narrowed towards base. Androecium with distinct group of staminodes on outer side. Staminodes ca 100, linear, ca 4—6 × 0.3 mm, yellow, obtuse at apex. Stamens ca 175, outermost ones slightly curved in bud, ca 8 mm long, innermost ones with apical part reflexed outward in bud, ca 13 mm long, with stamens of intermediate lengths between; filament of outermost stamens ca $3^1/_2$, of innermost ones ca 2 mm long; anther ca 0.5 mm broad, obtuse at apex; thecae linear, opening with pore near apex on outer side. Carpels 5—8, usually 7, arranged around sharp conical receptacle, light green, elliptic, ca 5 × 2 mm, glabrous, each with 7—10 ovules; styles spreading, filamentous, ca 10 mm long, 0.5 mm thick, yellowish white. *Pseudocarps* dehiscent, when ripe sepals enlarged to 18—25 × 10—15 mm; carpels red, 20—25 × 10—16 mm, each with 1—4 seeds. Seeds obovoid, ca 3 × 2 mm, brown or black, enclosed by scarlet, membranous aril.

Sumatra: Palembang: Pladju, *Polak 140*, fl. & fr. Oct. 1930 (BZ). — Banka: *Horsfield*, fl. (BM); *Kurz 425*, fl. (K); Baturusak, *Amand*, fl. June 1858 (U); *Ploem*, fl. & fr. (L); Djebus, *Berkhout 72*, fl. Aug. 1886 (BZ); *Berkhout* (BZ); G. Menumbing, near Muntok, *Bünnemeyer 1351*, fl. & fr. Oct. 1917 (BZ, L); Bakem, Sungai Liat, *Bünnemeyer 1731*, fl. Oct. 1917 (BZ); Sungai Lajang, Sungai Liat, *Bünnemeyer 1807*, fl. & fr. Oct. 1917 (BZ, L); Sungai Liat, Rebo, *Bünnemeyer 2510*, fl. Nov. 1917 (BZ); near Pangkalpinang-Belinju, *Huitema 24*, fl. 1932 (BZ); Bakit, Belinju, *Coert 1630*, fl. Sept. 1941 (L). — Billiton: *Riedel*, fl. (FI); S of Manggar, *Ham 32*, fr. March 1907 (BZ). — Riouw-Lingga Arch.: Pulau Tudjuh, Ajer Suar, *Bünnemeyer 5966*, fl. & fr. May 1919 (BZ, L); Sungai Tanda, Pulau Lingga, *Bünnemeyer 6933*, fl. July 1919 (BZ).

Malay Peninsula: *Walker 224*, fr. (GL, P); Sungai Iwong, *Goodenough*, fl. May 1892 (BM). — Perak: Maxwell's Hill, Taiping, *Henderson SF 10014*, fl. & fr. 1922 (SING); Taiping, *Henderson SF 10358*, fr. Jan. 1923 (SING); Tinmines, Taiping, *Haniff SF 13120*, March 1924 (SING). — Pahang: Balok, *Yeop CF 3616*, fr. Jan. 1920 (K, SING). — Selangor: Rawang Distr., *Goodenough 10470*, fl. March 1899 (SING); Garcona Kuala Lumpur, *Kalong CF 17479*, fl. Aug. 1929 (SING); *Franck 1115*, fl. & fr. Sept. 1937 (C); Tinmines, Kanching, *Nur SF 34430*, fl. & fr. Nov. 1937 (MO, SING). — Negri Sembilan: Seremban, *Alvins 1783*, fr. July 1885 (SING). — Malacca: fr. (SING); *Gaudichaud 26*, fl. & fr. Feb. 1837 (G, P); *Cuming 2358*, fl. 1840 (BM, CGE, K); *Delessert*, fl. & fr. 1840 (G); Ayer Panas, *Griffith (Herb. E. I. Comp. 55)*, fl. & fr. 1845 (C, CGE, FI, GH, K, L, M, NY, P); *Griffith*, fr. (CAL); *Maingay 1020 (Kew Distr. 4)*, fl. 1865—6 (K); *Maingay 1020A (Kew Distr. 4)*, fl. May 1868 (CAL, K, L); *Alvins*, fl. & fr. (SING); Bukit Bruang, *Holmberg 719*, fl. & fr. Apr. 1891 (MEL, SING); *Hervey*, fl. 1891 (BM, CAL, SING); *Hervey*, fl. & fr. Apr. 1893 (CAL, P); *Hervey*, fr. (A). — Johore: Pinyerong, *Ridley*, fr. May 1889 (SING); Pulau Tekong, *Ridley 3966*, fl. 1890 (SING); *Ridley*, fl. 1890 (BM); Kuala Sedili Besar, *Feilding*, fl. 1892 (SING); Sedili Kechik, *Yeob CF 5832*, fl. & fr. July 1921 (SING); Mawai, Sedili, *Corner SF 21189*, fl. & fr. May 1932 (K, NY, SING); Sungai Sedili, *Corner SF 32984*, fl. & fr. May 1937 (L, SING); Sungai Sedili, near Mawai, *Corner SF 33546 & 33547*, fl. & fr. June 1937 (L, SING). — Pulau Penang: *Delessert*, fl. & fr. 1835 (G). — Singapore: *Thomson 10*, fl. (K, P); *Lobb 329*, fl. (CGE, FI, G, GH, GL, K, MEL, OX); *Anderson 2*, fl. Oct. 1861 (CAL, MEL); *Kurz 2961*, fl. (CAL); *Maingay 2624A (Kew Distr. 4)*, fl. & fr. 1867 (BM); *Maingay 2624 (Kew Distr. 4)*, fl. 1867—8 (K); *Kuntze 6094*, fl. Oct. 1875 (NY); *Hullett 61*, fl. 1884 (K); *Haviland* (CAL); Jurong, *Ridley 435*, fl. Oct. 1889 (CAL, SING); *Ridley*, fl. 1890 (UC); Tangkei, *Ridley*, fl. & fr. Jan. 1905 (MO); *Ridley*, fl. & fr. (CAL, SING); Pulau Ubin, *Ridley*, fl. (SING).

Java: W. Java: *Ploem*, fl. (L); Regantang, *Boerlage*, fr. June 1888 (L); Warung Manga, Kedunghalang, *Boerlage 157*, fr. Oct. 1888 (L); Buitenzorg, *Boerlage*, fl. & fr. Dec. 1888 (L); ibidem, *Hallier 2a*, fl. & fr. Apr. 1893 (BZ); Djasinga, *Backer 9903*, fl. Nov. 1913 (BZ); ibidem, *Backer 10056*, fl. & fr. Nov. 1913 (BZ); E of Depok, *Backer 23168*, fl. Jan. 1918 (BZ); S of Djasinga, *Backer 26022*, fr. 1918 (BZ); E of Depok, *Backer 26285*, fl. Oct. 1918 (BZ); Depok, *Bakhuizen van den Brink Jr 890*, fl. & fr. Nov. 1921 (BZ, CAL, G, K, L, P, SING); Tegal Sapi, *Bakhuizen van den Brink Jr 1568*, Aug. 1922 (BZ); Djambu near Leuwiliang, *Bakhuizen van den Brink 7830*, fl. & fr. Aug. 1931 (BZ, K, L, U); Tendjoleat near Bunar, *de Voogd 5*, fl. Oct. 1940 (BZ); Land Bolang near Bunar, *van Steenis 12681*, fl. Nov. 1941 (BZ); Parung Pandjang, *Broekhuizen 15*, fl. & fr. Dec. 1944 (BZ); ibidem, *Broekhuizen 9*, Feb. 1945 (BZ, L); ibidem, *Broekhuizen*, fr. Feb. 1945 (BZ).

Borneo: (CAL, U); *Korthals*, fl. & fr. (CAL, K, L, MEL, S); *U. S. S. Pac. Expl. Exped. 1838—42*, fl. (NY); *Burbidge*, fl. (K). — NW. Borneo: Kuching, *Beccari PB 175 & 192*, fl. & fr. July 1865 (FI, K, P); Brunei, *Beccari PB 4067*, fl. Aug. 1867 (FI); Rajang, Sibu, *Haviland = 2100*, fl. Nov. 1892 (UC); near Kuching, *Haviland 2100*, fl. & fr. Dec. 1892 (K); ibidem, *Haviland & Hose = 2160*, fl. & fr. Oct. 1894 (BM, BZ, CAL, CGE, GH, K, L, P); Kuching, *Ridley*, fr. Aug. 1899 (SING); Sarawak, *Nat. Coll. 557*, fl. (A); Kapit, Upper Rajang Riv., *Clemens 21167*, fl. May 1929 (A, BZ, K, MO, NY). — W. Borneo: *Chaper*, fr. (P); Sintang, *Langlassé 68*, fl. June 1894 (P); ibidem, *Langlassé 87*, fl. June 1894 (G, P); Aer Itam N of Pontianak, *Polak 680*, fl. Oct. 1940 (BZ, L); Pontianak, *Enoh 290*, fl. Sept. 1948 (BZ, K, L). — S. and SE. Borneo: Martapura, *Korthals*, fl. (L); Pulau Lampei, *Korthals*, fl. & fr. (L); Tewingan near Martapura, *Labohm 1180*, fl. June 1918 (BZ); Asem near Pleihari, *Labohm 1956*, fl. May 1919 (BZ); Rantau, Antasan Mastam, *Dachlan 17*, fl. Aug. 1922 (BZ). — E. and NE. Borneo: Sungai Bontanan, Bontang, *Rutten 417*, fr. March 1911 (BZ, U); Sungai Berbas, Bontang, *Rutten 496*, fl. & fr. May 1911 (U); Tikung, *Amdjah 917*, fl. & fr. Nov. 1912 (BZ, L, UC); *Amdjah 1017*, fl. 1912 (BZ); near Sadjan Riv., Bulongan, *Rutten 88*, fr. 1914 (U). — Br. N. Borneo: Kudat, *Frazer 120*, fl. June 1885 (K); Sandakan, *Creagh*, fl. Apr. 1895 (K); Kinabalu Region, *Gibbs 2930*, fl. 1910 (BM); Sandakan, *Clemens 9504*, fl. Dec. 1915 (A); *Wood 458*, fl. May—Aug. 1917 (K); *Yates 56*, fr. Oct. 1917 (A, US); Sandakan & Vicin., *Wood 794*, fl. & fr. Feb.—March 1920 (A, BZ, L, US); Sandakan, Myburgh Prov., *Elmer 20104*, fl. & fr. Oct.—Dec. 1921 (A, BM, BZ, C, CAL, K, L, M, MO, NY, P, S, SING, U, UC); Kg Mengalong, Weston, *Suleiman BNB 2221*, fr. Apr. 1932

(BZ, IFI, K); Talaga, *Balajadia BNB 2561*, fl. Aug. 1932 (A, BZ, IFI, K); Mt Kalawat, Kinabalu, *Clemens 51317*, fl. Jan. 1934 (BM); Kabili For. Res., Sandakan, *Puasa BNB 4846*, fl. & fr. June 1935 (SING); Jambongan Isl., *Cabiling BNB 3776*, fl. (UC); Tiaggau Riv., *Keith BNB 9091*, fl. June 1938 (SING); Marudu, Kudat, Kitaku For. Res., *Austin BNB A 1182*, fl. Feb. 1948 (SING); Elopura, Sandakan, *Anthony BNB A 788*, fr. March 1948 (SING); ibidem, *Kadir BNB A 901*, fl. Dec. 1948 (SING); ibidem, *Kadir BNB A 2691*, fl. & fr. (L). — Banguey Isl.: *Castro & Melegrito 1502*, fl. Sept. 1923 (A, UC, US). — Labuan: *Low 192*, fl. & fr. 1867 (FI); *Treacher*, 1880 (S). — Anambas & Natuna Isls: near Genting, Sedanau Isl., *van Steenis 1055*, fr. Apr. 1928 (BZ, L).

Philippines: *Loher 20*, fl. (K). — Luzon: Mt Makiling, Laguna Prov., *Quisumbing*, fr. Sept. 1925 (UC).

Cultivated: Bot. Gard. Bogor (origin: Banka): *Teysmann*, fl. & fr. 1860 (L); *Kurz 425*, fl. (CAL); *Kurz*, fl. 1863 (P); *Teysmann*, fr. 1867 (L); *Beccari*, fl. 1876 (FI); *Boerlage*, fl. (L); no IV-G-18, fl. Nov. 1889 (BZ); *Janse*, 1899 (GRO); no IV-G-18, fr. 1903 (GH, NY, US); *van Harreveld*, fl. & fr. Sept. 1907 (GRO, L); *Backer*, fl. 1908 (BZ); fl. & fr. Apr. 1912 (BZ); no IV-G-18a, fr. 1916 (BZ); *Fevrell & Heide*, fl. & fr. Dec. 1921 (S). — Kultuurtuin Bogor: fl. & fr. (U); *Giesenhagen*, fl. Feb. 1900 (M); no A-III-738, *Idris*, fl. & fr. May 1924 (WAG). — Victoria Garden, Bombay: *Land*, fl. Dec. 1935 (CAL). — Jamaica: Castleton Distr. (escape from Bot. Gard.), *Harris 10889*, fl. March 1910 (K, NY, U). — Public Gardens, Kuala Lumpur: *Strugnell CF 12622*, fl. Jan. 1927 (SING). — Manila: Manila Gardens, *Quisumbing BS 84737*, fl. (NY); *Fénix 92*, fl. & fr. Apr. 1938 (A); College of Agric., Laguna, *Sulit PNH 6977*, fl. & fr. Dec. 1947 (A). — Panama Canal Zone Exper. Gard.: *Wetmore & Abbe 228*, fl. Jan. 1932 (A). — Bot. Gard., Penang: *Nur*, fl. Sept. 1918 (SING). — Bot. Gard., Peradeniya: *Fairchild & Dorsett 262*, fl. Feb. 1926 (UC). — Royal Lakes Gard., Rangoon: *Parkinson 14029*, fl. March 1932 (DD); *Parkinson 14455*, fl. June 1932 (DD). — School Gard., Semarang: *Docters van Leeuwen-Reynvaan*, fl. June 1910 (BZ). — Sierra Leone: *Lane-Poole 118bis*, fl. June 1912 (K). — Bot. Gard., Singapore: fl. (A); *Hullett*, fl. & fr. Aug. 1885 (SING); *Curtis*, fl. Sept. 1900 (SING); *Sargent*, fl. Oct. 1903 (A); Lawn T, *Nur*, fl. Aug. 1918 (UC); *Nur*, fl. May 1919 (UC); Lakeside, *Nur*, fl. & fr. Aug. 1920 (CAL, SING, UC); Arboretum, *Nur*, fl. June 1924 (SING); *Kiah*, fl. May 1929 (IFI); Lawn G, *Nur*, fl. Oct. 1929 (BRI, BZ, SING); *Clemens 22502*, fl. & fr. Nov. 1929 (NY, P); *Furtado SF 34822*, fl. Feb. & Sept. 1938 (A, DD, IFI, L, SING). — Bot. Gard., Trinidad: *Broadway*, fl. May 1927 (IFI).

Distribution. Sumatra, Malay Peninsula, Riouw and Lingga Archipelagos, Banka, Billiton, Borneo, W. Java, Philippines. From Sumatra the species is known only from Palembang. The two collections from the Philippines may represent cultivated or naturalized specimens; I strongly suspect the species not to be indigenous in the Philippines. De Wit (1949) has pointed out that the species would be indigenous in Java. I do not agree with him for the following reasons: The first collecting of the species outside the Botanic Garden was done in 1888, i. e. about 30 years after its introduction. The first collections are all close near Bogor and later collections gradually come to farther distances. It is difficult to understand that a species like the present one with large and conspicuous flowers would have escaped the attention of earlier collectors, particularly as it flowers throughout the whole year in Bogor.

Ecology. In marshes, along streams, and on the margin of forests, sometimes immediately behind the mangrove, up to 500 m altitude Flowering continuously, each flower open for one day only; between the flowers of one raceme a difference in flowering-time of about 3—4 days. The fruit ripens after 36 days (Corner, 1940); the arillate seeds are eaten by birds, what may be a means of dispersal.

Vernacular names. Sumatra: *Sempur ajor, S. rawah* (Palembang); *Simpong, Kaju sipur* (Riouw and Lingga Arch.); *Kembang masimpur (mesimpur), Minipor, Simpur, Simpor prampuan, Sipor* (Banka); *Simpur* (Billiton). Malay Peninsula: *Champurna, Simpoh ayer* (= water simpoh), *S. gajah* (= elephant or big s.), *S. pasir, S. paya* (= marsh s.). Borneo: *Simpur* (Mal., SE. Borneo), *Simpor ayer* (Mal., Br. N. Borneo), *Simpor bini* (Mal., Brunei), *Simpor rimba* (Kedayan, Br. N. Borneo), *Tambakau* (Tengara, Br. N. Borneo).

Uses. Because of its beautiful foliage and abundant flowering the species is often planted as an ornamental shrub.

Notes. 1. *Wormia suffruticosa* and *W. subsessilis* differ only in the indument of the lower side of the leaves and petioles, this being villose in *W. suffruticosa*, glabrous in *W. subsessilis*. As several intermediates are known, the distinction of two separate taxa does not appear to be justified.

2. *Wormia subsessilis var. borneensis* differs from the other specimens by the large leaves and the different colour of the pseudocarp, this being white. As to the latter difference, I do not think it to be of any importance, whereas as to the other characters the pseudocarps in the type specimen of *var. borneensis* agree with those in other specimens. As to the size of the leaves, these are really large in the specimen cited, but intermediates as to size are found in a number of collections.

31. Dillenia fagifolia Hoogl. spec. nov.

Dillenia fagifolia Hoogl., Fl. Mal. I, 4, 1951, p. 162, descr. angl..

Type specimen: L. S. Smith NGF 1229, near Aitape, New Guinea, Jan. 1945; holotype in L.

Descriptio typi: Rami novelli hirsuti; cicatrices amplexicaules. Folia elliptica, $12^{1}/_{2}$—16 × 8—10 cm, 17—19-nervata, apice obtusa, basi obtusa vel rotundata, margine integra vel minime undulata. Petiolus 5—$5^{1}/_{2}$ cm longus, alatus alis amplexicaulibus caducis. Inflorescentia terminalis, 6-flora. Flores in alabastro tantum, pedunculo usque ad 1.2 cm longo. Sepala 5, exterius 22 × 25 mm. Petala 5. Stamina ∞, exteriora (ca 60) 5—$2^{1}/_{2}$ mm longa, longitudine centripetaliter deminuente, apice acuminata acumine 0.3 mm longa; interiora (ca 90) sterilia, ca 1 mm longa. Carpella 12, glabra, elliptico-oblonga, ca 2 × 1 mm, 12—14-ovulata, stylo 1 mm longo.

Fig. 9 a—d, p. 81.

Large evergreen trees, ca 42 m high, 1 m thick, with ca 24 m bole, with branched buttresses and chanelled to ca 3.3 m height. Bark reddish brown, peeling off in papery scales; wood pinkish or pale red brown. Branches sympodial, younger ones ca 4 mm thick, hirsute, glabrescent. Leaf-scars amplexicaul, for about $^{1}/_{2}$ single line, for $^{1}/_{2}$ triangular with ca 20 leaf-traces in central part. *Leaves* elliptic, $12^{1}/_{2}$—16 × 8—10 cm, with 17—19 nerves on either side; obtuse at apex, obtuse to rounded at base; margin entire to very slightly undulate, nerves rather straight, slightly curving upward near margin, bifurcate at ca $^{1}/_{2}$ cm from margin, upward directed fork anastomising with downward directed one of next nerve; shortly hirsute with 0.2—0.5 mm long hairs above, more densely hirsute with thinner hairs, up to $1^{1}/_{2}$ mm long, beneath. Petiole 5—$5^{1}/_{2}$ cm, glabrous above, hirsute beneath, with amplexicaul wings; wings broadly linear, 7—8 mm broad, with rounded apex slightly exceeding insertion to petiole, glabrous above, hirsute beneath, wholly caducous. *Inflorescences* terminal, 6-flowered racemes, ca 6 cm long, with tortuous axis; axis $2^1/_2$—$1^1/_2$ mm thick, more densely hirsute than younger branches, without bracts. *Flowers* known only from buds. Pedicel up to 12 mm long, $1^1/_2$ mm thick, thickened to $2^1/_2$ mm at apex, hirsute like axis of inflorescence, without bracteoles. Sepals 5, outermost one ca 22 × 25 mm, enclosing about $^3/_4$ of bud, glabrous inside, hirsute outside, ciliate at margin; 4 inner ones smaller, but probably not fully developed. Petals 5. Stamens ca 60, strongly curved inward in bud, gradually decreasing in size towards centre of flower, 5—$2^1/_2$ mm long; filament $1^1/_2$—1 mm long, 0.5—0.3 mm broad; anther ca 0.6—0.4 mm broad, acuminate at apex; thecae linear. Staminodes within stamens ca 90, oblong, ca 1 mm long, 0.2 mm broad. Carpels 12, arranged around very broad conical (possibly narrower in older flower) receptacle, elliptic-oblong, ca 2 × 1 mm, glabrous, each with 12—14 ovules; styles spreading, ca 1 mm long. *Pseudocarps* unknown.

New Guinea: Terr. of New Guinea: a few miles SE of Tadji airstrip near Aitape, *L. S. Smith NGF 1229*, fl. Jan. 1945 (L).

Distribution. New Guinea, near Aitape.

Ecology. The type locality is at about 10 m altitude.

Vernacular names. *Ainedin* (But near Wewak).

Note. Though the type collection has only buds in a probably very young stage I have described the species as new as the structure of the androecium is so striking, that confusion with any other known species is impossible. This type of androecium has not been observed in any other *Dillenia*, whereas the differences cannot be explained as due to the age of the buds. In all other species the innermost stamens are about equally or further developed than the outermore ones already in very young stages.

32. Dillenia eximia Miq. 1860

Dillenia eximia Miq., Fl. Ind. Bat. Suppl., 1860, p. 620; Miq., Ann. Mus. Bot. Lugd. Bat. 4, 1868, p. 79; Merr., Bibl. En. Born. Pl., 1921, p. 383; Hoogl., Fl. Mal. I, 4, 1951, p. 166.

Dillenia crassisepala Martelli in Becc., Malesia 3, 1886, p. 156; Merr., Bibl. En. Born. Pl., 1921, p. 383.

Wormia scortechinii King, J. As. Soc. Beng. 58, II, 1889, p. 365.

Wormia kunstleri King, J. As. Soc. Beng. 58, II, 1889, p. 366.

Dillenia scortechinii (King) Ridl., J. Str. Br. R. A. S. 54, 1910, p. 7; Ridl., Fl. Mal. Pen. 1, 1922, p. 12.

Type specimens: *Dillenia eximia:* Teysmann 4402 HB, Kebang, Lampongs, Sumatra; holotype in U, isotypes in BZ, CAL, L. — *Dillenia crassisepala:* Beccari PB 2554, Mt Mattang, Sarawak, Sept. 1866; holotype in FI. — *Wormia scortechinii:* Scortechini 1864, Bujong, Malacca, March 1883; holotype in CAL, isotypes in BM, FI, K, L, SING, UC. — *Wormia kunstleri:* Kunstler 5905, Goping, Larut, Perak, April 1884; holotype in CAL, isotypes in K, SING.

Large deciduous trees, up to 40 m high, 70 cm thick, with up to 30 m straight bole and large buttresses, passing into stilt-roots up to 3 m high, 10 cm thick and running out to 5—6 m; crown dense, broad. Bark reddish, brownish, or greyish, smooth, not flaky, up to 12 mm thick. Sapwood and heartwood light yellow. Branches sympodial, younger ones 3—4 mm thick, densely shortly rigidly hirsute, glabrescent, when older with longitudinal fissures. Leaf-scars clasping about $^1/_2$ of branch, broadly subfalcate with ca 13 leaf-traces about middle. *Leaves* elliptic to obovate, (10—)15—25(—35) × (6—)9—15(—18) cm, with (14—)18—28(—35) nerves on either side, on young trees and saplings much longer and relatively narrower, 35—75 × 13—25 cm, ca 45—80-nerved; rounded to obtuse, rarely somewhat acuminate at apex, obtuse to somewhat cordate at base; margin entire to undulate-dentate, nerves rather straight, ending in margin, often with small tuft of hairs at apex; glossy, shortly hirsute, glabrescent on intervenium, slightly to densely shortly hirsute on nerves, densely shortly hirsute on midrib above, sparsely to rather densely hirsute on intervenium, strigose-hirsute on nerves and midrib beneath. Petiole 3—7, on young trees and saplings up to 17 cm, glabrous above, densely shortly hirsute or strigose-hirsute beneath, more or less densely ciliate at margin. *Inflorescences* appearing with leaves, terminal, soon lateral, leaf-opposed, (3—)5—12(—18)-flowered, fasciculately branched, forming loose cluster with branches often partly coherent, often immediately at foot 2- or 3-branched; first internode $1^1/_2$—7 cm; branches $1^1/_2$—2 mm thick, 2—3 mm in fruit, hairy like younger sterile branches; bracts caducous, sessile, lanceolate, up to 12 × 3 mm. *Flowers* apetalous, ca $2^1/_2$ cm across, yellowish. Pedicel 5—15 mm, 1—$1^1/_2$ mm thick, hairy like branches of inflorescence, without bracteoles. Sepals 5, about circular, ca 9—12 × 9—11 mm, 3 outermost ones hirsute in apical part (up to 4 mm broad) and along margin, glabrous in central and basal part, 2 innermost ones wholly glabrous inside, all hirsute outside except in bud covered margins which are glabrous for breadth of ca 1 mm, ciliate at margin. Petals absent. Stamens ca 150—180, slightly curved in bud, all of about same length (innermost ones only very slightly longer), $4^1/_2$—$5^1/_2$ mm; filament white, 2—$3^1/_2$ mm long, longest in innermost stamens, 0.3—0.5 mm broad; anther ca 0.5 mm broad, obtuse at apex; thecae yellow, linear, opening with apical pore, ciliate at margin with few 0.2—0.3 mm long glassy hairs. Carpels (4—)5(—6), arranged around conical receptacle, white, oblong, ca $3^1/_2$ × $1^1/_2$ mm, glabrous, each with ca 30 ovules; styles spreading, white, flattened, ca 5 mm long, near base 0.5 mm thick, 0.6 mm broad, channelled above. *Pseudocarps* indehiscent, dark green, about globular, slightly appressed, ca 30 mm diam., 25 mm high including enclosing sepals, which are up to 40 × 27 mm, at base up to 8 mm thick; carpels ca 10 × 7 mm, 1(—2)-seeded. Seeds ovoid, $5^1/_2$ × $3^1/_2$ mm, glossy dark brown to black, with ca 0.2 mm long aril.

Siam: Nakawn Sritamarat: Kao Soi Dao, Patalung, *Kerr 19228,* fl. Apr. 1930 (BM).

Sumatra: *Korthals* (L, U). — Tapanuli: Sibolga, near Barus, *NIFS bb 31025,* fr. Dec. 1939 (A, BZ, L, SING). — Sum. W. Coast: Lubualung, *Teysmann 455 HB* (BZ). — Sum. E. Coast: Pangloug, Sungei Missigit, Bengkalis, *Beguin 569,* fl. & fr. Jan. 1920 (BZ, L). — Indragiri: Pulau Kedongon, Kuantan Distr., *NIFS bb 24828,* June 1938 (BZ, L, SING); Muara Pedjangki, Indr. Bovenl., *NIFS bb 27478,* Apr. 1939 (A, BZ, L); near Sungai Akar, Indr. Bovenl., *NIFS bb 28616,* July 1939 (BZ, L). — Djambi: Muara Sidjuan, *NIFS bb 12822,* Sept. 1928 (BZ). — Palembang: Riv. Rupit, W of Suka Radja, *Forbes 2974,* fl. 1881 (BM, CAL, FI, L, P, SING); Riv. Rupit, *Forbes 3002,* fl. 1881 (L); Lematang Ulu, *Grashoff 124,* Jan. 1915 (BZ); Banjuasin and Kubu Regions, *Grashoff 763,* Oct. 1915 (BZ, L); Ogan Ulu near Sugihwaras, *Alfiah TB 466,* Aug. 1921 (BZ); Banjuasin and Kubu Regions, *Thorenaar 95-E-1P-924,* fl. Oct. 1921 & Sept. 1922, fr. Feb. 1922 (BZ, L); ibidem, *Thorenaar 95-E-1P-760,* fl.

July 1922, fr. Aug. 1922, & veg. Dec. 1919 (BZ, L, WAG); *Thorenaar T-3P-873*, Dec. 1922, fr. Oct. 1923 & Jan. 1924 (BZ, CAL, K, L, WAG); *Thorenaar 95-E-3P-T898*, fr. Oct. 1923 & Jan. 1924 (BZ, K, L, SING, WAG); Lematang Ilir, Darmo, *NIFS bb 8728*, June 1925 (BZ); Ogan Ulu near Sugihwaras, *NIFS bb 20104*, fr. Nov. 1935 (BZ); Lematang Ilir, Semangus Res., *NIFS bb 31738*, May 1940 (A, BZ, L). — Lampong Distr.: Kebang, *Teysmann 4402 HB* (BZ, CAL, K, L); Tulangbawang, near Manggala, *NIFS bb 8467*, June 1925 (BZ). — Riouw-Lingga Arch.: Tandjong Pinang, *Teysmann* (BZ).

Malay Peninsula: Kedah: Terai Res., *Mal CF 17849*, fr. May 1929 (SING). — Perak: Larut, *Kunstler 5905*, fr. Apr. 1884 (CAL, SING); Waterloo, *Curtis 2685*, May 1890 (K); Parit For. Res., *Symington CF 39460*, fr. Apr. 1935 (SING). — Trengganu: Ulu Brang, *Moysey & Kiah SF 33458*, fr. July 1937 (SING); ibidem, *Moysey & Kiah SF 33708*, fr. July 1937 (SING). — Selangor: Sungai Bulok Res., *Abu CF 4904*, Aug. 1919 (SING). — Malacca: Bujong, *Scortechini 1864*, fl. March 1883 (BM, CAL, FI, L, SING). — Johore: Ulu Segun, Gunong Santi, *Corner*, Apr. 1936 (SING); Sungai Sedili, *Ngadiman SF 36854*, fr. July 1939 (A, BZ, SING). — Pulau Penang: The Sput, *Curtis*, Apr. 1890 (SING); *Curtis 2465*, fr. July 1890 (BM, CAL, SING). — Singapore (probably at least partly cultivated): Garden Jungle, *Ridley*, fr. 1894 (BM, CAL, K, SING); ibidem, *Ridley 6178*, fl. 1894 (CAL, BM, SING); Reservoir Jungle, *Corner*, June 1937 (SING); Bukit Timah, *Corner SF 34906*, fl. March 1938 (SING); Garden Jungle, *Nur SF 18197*, Nov. 1941 (SING); Bukit Timah, *Ngadiman*, Nov. 1947 (SING).

Borneo: NW. Borneo: Mt Mattang, Sarawak, *Beccari PB 2554*, fl. Nov. 1866 (FI); near Kuching, *Haviland 1517*, fr. (K, SING; hirsute form). — W. Borneo: Sungai Smittau, *Hallier 1292*, fr. July 1917 (BZ, L; hirsute form); Ketapang, near Muara Kojong Sungai Kelik, *NIFS bb 7489*, Oct. 1924 (BZ; hirsute form); Simpang, Lubukbatu, *NIFS bb 7388*, Oct. 1924 (BZ); Sanggau, Sungai Labai, *NIFS bb 7872*, Feb. 1925 (BZ); Sekadan, Tamang, *NIFS bb 8017*, March 1925 (BZ); Sanggau, near Ketatai, *NIFS bb 18572*, May 1934 (BZ, L); Melawi, near B. Water Emang (near Ng Betung), *NIFS bb 26864*, Feb. 1939 (A, BZ, L). — S. and SE. Borneo: Bandjermasin, *Motley 895*, fl. & fr. 1857—8 (K; hirsute form); Pleihari, near Asam-Djorong, *NIFS bb 9509*, fr. Nov. 1925 (BZ); Muaratewe, near Muhut, *NIFS bb 10080*, Aug. 1926 (BZ); Sampit, near Natainangka Katimpun, *NIFS bb 14075*, fr. (BZ). — E. and NE. Borneo: Bungalun Riv., *Rutten 583*, Nov. 1912 (U); W. Kutai, Long Puhus, *Endert 4832*, fr. Nov. 1925 (BZ, K, L); W. Kutai, Long Djenau, *Endert 5077*, fr. Nov. 1925 (BZ, K, L); Bulungan, near Mara, *NIFS bb 10844*, Feb. 1927 (BZ); W. Kutai, near Longbleh, *NIFS bb 16119*, Nov.—Dec. 1931 (BZ, SING); ibidem, *NIFS bb 16144*, Nov.—Dec. 1931 (A, BZ, L); W. Kutai, Bukitlajang, *NIFS bb 16251*, Dec. 1931 (BZ, L, SING); ibidem, *NIFS bb 16256*, Dec. 1931 (BRI, BZ, SING); W. Kutai, near Longbleh, *NIFS bb 16140*, Nov.—Dec. 1931 (BZ, L); W. Kutai, *NIFS bb 17140*, Nov.—Dec. 1931 (A, L). — Br. N. Borneo: Beaufort (Jesselton Int. Distr.), *Cuadra BNB A 1358*, Apr. 1948 (SING).

Cultivated: Bot. Gard. Bogor (from Borneo): no IV-G-9, fl. (BZ).

Distribution. Sumatra, Malay Peninsula, and Borneo.

Ecology. In primary and old secondary forests at low altitudes (up to 300 m). Flowering in the Malay Peninsula from March to May, fruiting from April to July; in Sumatra and Borneo flowering from July to November, fruiting from July to January.

Vernacular names. Sumatra: *Ampalu* (Sum. W. Coast); *Simar timbaho darat* (Bataks, Tobo); *Mĕmpĕlu* (Sum. E. Coast); *Bira, Gawal, Gawar* (Indrag.); *Bawal* (Djambi); *Djangkang, Sedjerangkong, Simpur, S. kidjang, S. rawang* (Palemb.); *Simpur ajer* (Lamp.). Mal. Pen.: *Merah, Simpoh, S. jangkang* (= stilted s.). Borneo: *Entepung rimba* (Malay); *Beriga, Berige, Djonging, Kadjang, Kajo pajan, Keruing paya, Ketang bajut, Markadjang, Reriga, Riga, Soretang, Suretang, Tampuro, Tempuru* (Dajak Malay).

Notes. 1. *Dillenia eximia* Miq. was based on leaves from a sapling or young tree only. These leaves certainly belong to the species as concepted here. The occurrence of longer, narrower leaves in saplings and young plants is generally found in *Dillenia*. I have seen leaves of intermediate size and shape in flowering specimens, e. g. in the material from the tree, cultivated in the Botanic Garden at Bogor.

2. A few specimens are distinctly more hirsute than the species usually is. They are all from Borneo (*Haviland 1517, Hallier 1292, NIFS bb 7489, Motley 895)*. In habit these specimens strongly resemble *D. reticulata* and to my idea it is impossible to distinguish with certainty the hirsute form of *D. eximia* from *D. reticulata* if only sterile material is available. Under *D. reticulata* a number of specimens will be cited which belong to one of these two species, but can not be identified at the moment as the material is sterile (p. 80). The flowers and fruits have perfect characters for identification (structure of the androecium; presence or absence of petals; number of carpels), whereas I have not seen the nearly glabrous state, which is the commonest one in *D. eximia,* in *D. reticulata.*

33. Dillenia reticulata King 1889

Dillenia reticulata King, J. As. Soc. Beng. 58, II, 1889, p. 367; Ridl., Fl. Mal. Pen. 1, 1922, p. 11; Craib, Fl. Siam. En. 1, 1925, p. 25; *Foxw., Mal. For. Rec. 3, 1927, p. 148 (with 2 plates); Burk., Dict. Econ. Prod. Mal. Pen., 1935, p. 810; *Hoogl., Fl. Mal. I, 4, 1951, p. 168, fig. 11.

Wormia mollissima Boerl., Cat. Hort. Bogor., 1899, p. 5.

Type specimens: *Dillenia reticulata:* Scortechini 1840, Dipong, March 1883; holotype in CAL, isotype in K. — *Wormia mollissima:* Cultivated in Hort. Bogor., no IV-G-23, from Bonjong Wakka, Lampong Distr., Sumatra; holotype in BZ, isotype in BZ, CAL, FI, L, US.

Large deciduous trees, up to 40 m high, 70 cm thick, with straight bole, up to 30 m, with conspicuous stilt-roots to ca 2 m high. Bark brown. Branches sympodial, younger ones 4—7 mm thick, densely shortly hirsute, glabrescent, older ones with transverse and longitudinal fissures. Leaf-scars rather close to each other, clasping about $^1/_2$ of branch, subfalcate with ca 11 leaf-traces about middle of scar. *Leaves* elliptic or elliptic-oblong to obovate, (10—)15—30(—45) × (6—)10—20(—28) cm, with (16—)25—35(—40) nerves on either side, on saplings and young trees up to 90 cm long; rounded to slightly emarginate at apex, obtuse to rounded or slightly cordate at base; margin entire to slightly undulate-dentate, nerves only very slightly curving upward, ending in margin, often with small tuft of hairs at apex; shortly tomentose-hirsute on intervenium, densely so on nerves and midrib, more or less glabrescent above, rather densely shortly hirsute on intervenium, nerves, and midrib beneath. Petiole 4—10 cm, slightly winged with up to 2 mm broad, non-amplexicaul wings, glabrous above, densely shortly hirsute beneath, hairs increasing in length towards margins. Inflorescences terminal, soon lateral, leaf-opposed, (3—)5—10(—15)-flowered, fasciculately branched, forming loose cluster with branches often partly coherent, often immediately at foot 2- or 3-branched; up to 15 cm long, first internode up to 6 cm; branches 4—2 mm thick, rather densely shortly tomentose; bracts caducous, triangular, up to 10 × 6 mm. *Flowers* ca 8 cm across. Pedicel $1^1/_2$—4 cm, $1^1/_2$—2 mm thick, thickened to 3—4 mm at apex, densely shortly tomentose, without bracteoles. Sepals 5, broadly oval, ca 20—25 × 16—20 mm, glabrous inside except densely shortly hirsute margin, up to 5 mm broad at apex, gradually narrowing downward, rather densely shortly hirsute outside, ciliate at margin. Petals 5, yellow, obovate, ca 35 × 16 mm, rounded at apex, narrowed towards base. Stamens ca 400—440, all slightly curved in bud, those of outer whorl ca 11 mm long with 8 mm long filament, outermost ones within this whorl ca 5 mm long, with 1 mm long filament, size thence gradually increasing towards centre of flower, innermost ones ca 9 mm long with 4 mm long filament; filament 0.3—0.6 mm broad, gradually narrowing towards anther; anther ca 0.6 mm broad, rounded to obtuse at apex; thecae linear, opening with apical pore. Carpels 9—10, arranged around conical receptacle, lanceolate, ca 6 × $1^1/_2$ mm, densely hirsute in apical part or glabrous, each with 50—70 ovules; styles spreading, cylindric, 5—6 mm long, 0.5 mm thick near base, 0.2 mm near apex, channelled above. *Pseudocarps* indehiscent, greenish yellow, about globular, ca $3^1/_2$ cm diam., 3 cm high including enclosing sepals which are up to 45 × 42 mm, up to 6 mm thick at base; carpels ca 16 × $8^1/_2$ mm, 1—3-seeded. Seeds ovoid, ca $3^1/_2$ × $2^1/_2$ mm, glossy black, with ca 0.2 mm long aril.

var. reticulata

Dillenia reticulata King 1889, l. c..

Carpels densely hirsute in apical part.

Malay Peninsula: Malacca: Dipong, *Scortechini 1840,* fl. March 1883 (CAL, K); *Maingay 1620 (Kew Distr. 8),* fl. 1865—6 & May 1868 (CAL, GH, K, L).

var. psilocarpella Hoogl. var. nov.

Dillenia reticulata var. psilocarpella Hoogl., Fl. Mal. I, 4, 1951, p. 168, descr. angl.. — *Wormia mollissima* Boerl. 1899, l. c.. — Differt a var. reticulata carpellis glabris.

Type specimen: Henderson SF 21801, Tembeling, Pahang, 12 July 1929; holotype in K, isotypes in BM, BZ, DD, IFI, MO, NY, SING.

Carpels wholly glabrous.

Malay Peninsula: Perak: Sungai Brotal, *Tachun CF 39256,* fr. Feb. 1935 (SING). — Pahang: Tembeling, *Henderson SF 21801,* fr. July 1929 (BM, BZ, DD, IFI, K, MO, NY, SING). — Selangor: Kwala Lumpur, *Curtis 2312,* fl. Feb. 1890 (CAL, SING); Weld's Hill, Kwala Lumpur, *Ahmad CF 5024,* fl. March 1920 (SING); Ulu Gombak, *Strugnell CF 12605,* fl. March 1927 (SING). — Johore: Sungai Segun, Gunung Panti, *Corner SF 30678,* fl. Apr. 1936 (SING).

Sumatra: Palembang: Tandjong Ning, *Forbes 2832,* fr. 1881 (BM, GH, L); Riv. Rawas, Muara Mengkulem, *Forbes 3040a,* fr. 1880 (BM, CAL, L).

Borneo: S. & SE. Borneo: Tanah Bumbu, near Baru Srigadung, *NIFS bb 14208,* fr. Jan. 1930 (BZ). — E. and NE. Borneo: Balikpapan, near Riko, Gunung Haping, *NIFS bb 14961,* fr. Nov. 1930 (BZ, L).

Cultivated: Bot. Gard. Bogor (from Sumatra, Lamp.): *Beccari,* 1876 (FI); no IV-G-23, fr. & veg. (BZ, CAL, L, US). — Publ. Gard., Kwala Lumpur: *Meh CF 10316,* fr. June 1925 (E).

Distribution. Sumatra, Malay Peninsula, and Borneo; *var. psilocarpella* throughout the area of the species, *var. reticulata* known only from Malacca.

Ecology. In forests at low altitudes (up to 200 m), usually at swampy localities. The stilt-roots are also developed when the species grows on dry habitat. In general the flowering- and fruiting-time agree with that of *D. eximia*; besides the species was collected in fruit in the Malay Peninsula in February.

Vernacular names. Malay Peninsula: *Simpoh jangkang* (= stilted s.), *S. paya* (= marsh s.). Borneo: *Simpur, Tempuran.*

Note. In vegetative state the species can hardly be distinguished from hirsute forms of *D. eximia* (cf. under that species). The following specimens, known only from leaf-collections, are such forms, most probably referable to the present species:

Sumatra: Sum. W. Coast: Painan, near Duku, *NIFS bb 3122,* March 1922 (BZ, L). — Sum. E. Coast: Sungai Kuning, *Koorders 10291β*, March 1891 (BZ); Sigati, *Koorders 10289α*, March 1891 (BZ; type of *Dillenia rhizophora* Boerl. & Koord., cf. p. 135); Siak Sri Indrapura, near Tuassei, *NIFS bb 3614* (BZ, L); Selatpandjang, Penjengat, *NIFS bb 21524,* Oct. 1936 (BZ, L). — Indragiri: Kuantan Distr., Djake, *NIFS bb 26498,* Dec. 1938 (A, BZ, L).

Malay Peninsula: Perak: Kuala Kangsar, *Osman CF 7046,* Feb. 1922 (SING). — Pahang: Kamansul Res., Temerloh, *Hamid CF 10687,* Oct. 1925 (SING).

Borneo: W. Borneo: Kapuas, Selimbau, *Teysmann 8147 HB* (BZ); Ulu Kenepai, *Hallier 1460,* 1893—4 (BZ, L). — S. & SE. Borneo: Gunung Pamatton, Martaraman, Riam, etc., *Korthals* (L); Tanah Bumbu, Baru, *NIFS bb 13044,* Dec. 1928 (BZ). — E. & NE. Borneo: W. Kutai, Kombeng, *Endert 5176,* Nov. 1925 (BZ, L); Balikpapan, Sepaku, *NIFS bb 24646,* June 1938 (A, BZ, L); Balikpapan, Sepan, *NIFS bb 25596,* Aug. 1938 (BZ).

34. Dillenia borneensis Hoogl. spec. nov.

Dillenia aurea Auct. non Sm.; Martelli in Becc., Malesia 3, 1886, p. 155.

Dillenia borneensis Hoogl., Fl. Mal. I, 4, 1951, p. 166, descr. angl..

Type specimen: NIFS bb 28108, Melawi, W. Borneo, 18 May 1939; holotype in L, isotypes in A, BZ, K, NY, SING.

Descriptio typi: Rami novelli glabri; cicatrices semi-lunulares, ramum dimidio amplectentes. Folia juvenilia obovata vel elliptica, usque ad 12 × $7^{1}/_{2}$ cm, 14—29-nervata, apice rotundata, basi obtusa decurrente, margine minute dentata. Petiolus usque ad 7 cm, supra dense sericeus, subtus glaber. Inflorescentia terminalis, mox lateralis, basi trifurcata. Flores ad 6 cm diam., pedunculo 5—20 mm longo. Sepala 5, 12—20 × 8—14 mm. Petala 5, in alabastro ad 25 × 15 mm. Stamina ca 335, exteriora ca 11 mm longa filamento 9 mm longo, apice intus curvata, longitudine in staminibus interioribus deminuente usque ad 4 mm longa filamento 2 mm longo, verticilli intimi stamina ca 13 mm longa filamento 11 mm longo, apice (2 mm) recurvata. Carpella 8, glabra, lanceolata, ca 8 × 1 mm, ca 25-ovulata, stylis divergentibus ca 8 mm longis.

Fig. 9 e—h, p. 81.

Deciduous trees, up to ca 36 m high, 70 cm thick, with stilt-roots. Branches sympodial, younger ones ca 4 mm thick, glabrous to sparsely strigose-hirsute, glabrescent. Leaf-scars clasping about $^{1}/_{2}$ of branch, semi-lunular with ca 15 leaf-traces about middle. *Leaves* elliptic to elliptic-oblong or obovate, (12—)25—40 × ($7^{1}/_{2}$—)12—20 cm, with (14—)25—35 nerves on either side; rounded, sometimes slightly retuse at apex, obtuse, often slightly unequal-sided at base, decurrent; margin minutely undulate-

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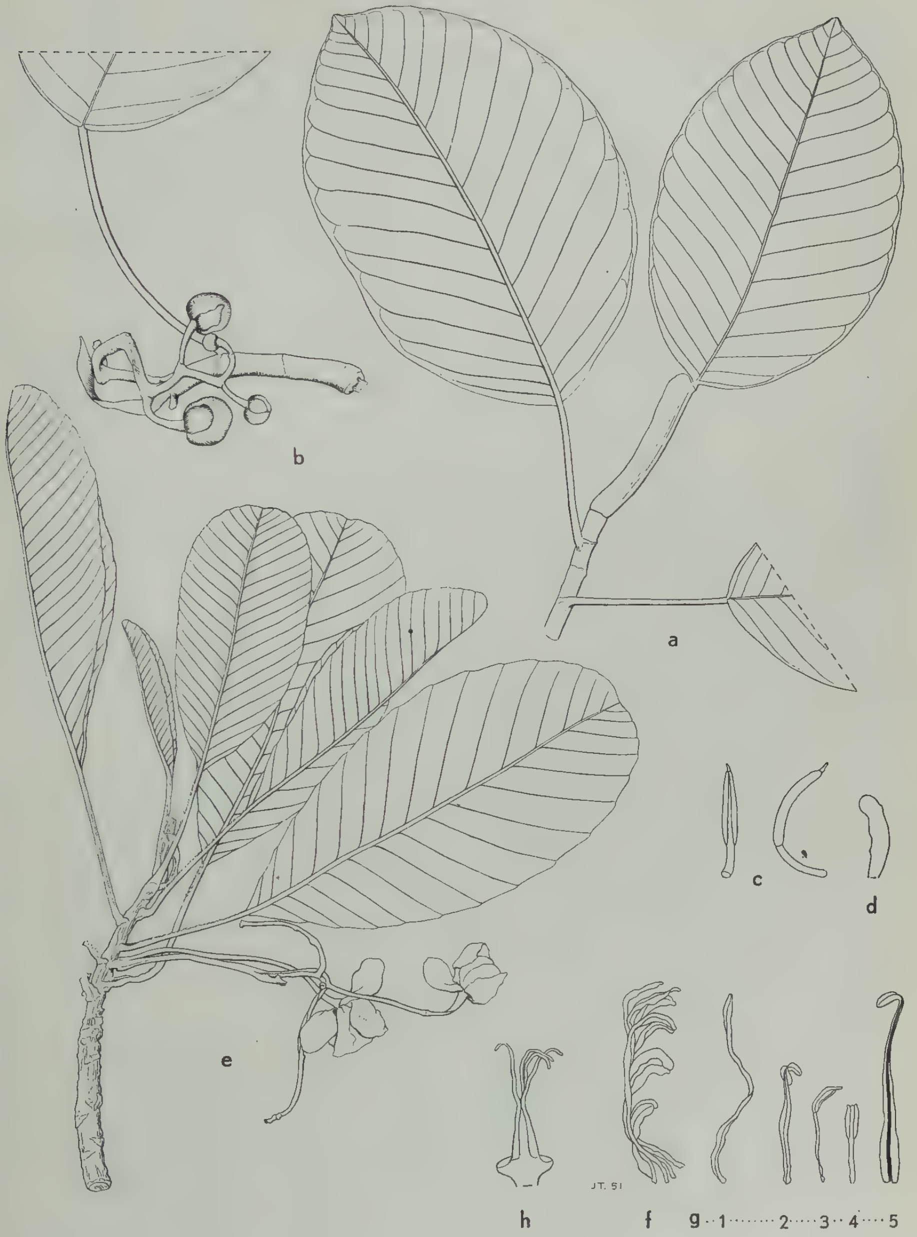
Fig. 9 — a, b, c, d. *Dillenia fagifolia* Hoogl. (p. 74); a. vegetative branch, × $^{2}/_{5}$; b. inflorescence, × $^{4}/_{5}$; c. stamen as seen from the centre of the flower and from aside, × 4; d. staminode, × 12; all after type specimen; e, f, g, h. *Dillenia borneensis* Hoogl. (p. 80); e. flowering branch with inflorescence with flowers in bud and young leaves, × $^{2}/_{5}$; f. stamens from the outer group as present in the nearly open flower, × $2^{1}/_{2}$; g. stamens in sequence from outside towards the centre of the flower, 1—4: stamens of the outer group, 5: stamen of the inner group, × $2^{1}/_{2}$; h. gynoecium, longitudinal section, × $1^{1}/_{4}$; all after type specimen.


b
a
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f
g 1 2 3 4 5

dentate, nerves only slightly curving upward, ending in margin, often with small tuft of hairs at apex; sparsely strigose-hirsute, glabrescent above, glabrous on intervenium, sparsely strigose on nerves and midrib beneath. Petiole 4—9 cm, with 1—3 mm broad, non-amplexicaul, often upwards conduplicate wings, densely sericeously hirsute above, glabrous to sparsely strigose-hirsute, glabrescent beneath. *Inflorescences* terminal, soon lateral, leaf-opposed, 3—10-flowered, fasciculately branched, forming loose cluster with branches often partly coherent, often immediately at foot 2- or 3-branched; up to 15 cm long, first internode 4—6 cm; branches ca $2^1/_2$ mm thick, glabrous to sparsely hairy like younger branches, without bracts. *Flowers* ca 6 cm across. Pedicel 5—20 mm, ca 1 mm thick, thickened to ca $1^1/_2$ mm at apex, hairy like branches of inflorescences, without bracteoles. Sepals 5, oval, 12—20 × 8—14 mm, glabrous inside, sparsely strigose-hirsute where exposed in bud, further glabrous outside, ciliate at margin. Petals 5, yellow, obovate, ca 25 × 15 mm (or larger?), rounded at apex, narrowed towards base. Stamens ca 335, outermost ones ca 11 mm long (incl. 9 mm long filament), those towards centre gradually diminishing to 4 mm (incl. 2 mm long filament), all with apical part strongly curved inward, innermost whorl consisting of ca 13 mm long stamens (incl. 11 mm long filament) with apical part (ca 2 mm) reflexed outward; filament of outermost stamens at base 1 mm broad, gradually narrowing to 0.3 mm at apex, that of innermore ones ca 0.6—0.2 mm broad; anther ca 0.8 mm broad, rounded at apex; thecae linear, opening with lateral longitudinal slits from apex downward. Carpels 7—8, arranged around narrow conical receptacle, lanceolate, ca 8 × 1 mm, glabrous, each with ca 25—50 ovules; styles slightly divergent, ca 8 mm long, ca 0.3 mm thick near base. *Pseudocarps* unknown.

Borneo: NW. Borneo: Mt Mattang, *Beccari PB 4064*, fr. 1866 (FI). — W. Borneo: Liang Gagang, *Hallier 3066*, 1893—4 (BZ, L); Sanggau, near Semrangkai, *NIFS bb 7015*, July 1924 (BZ); Sanggau, Ketatai, *NIFS bb 18571*, fr. May 1934 (A, BZ, L); Melawi, near Kelawaideras, *NIFS bb 28108*, fl. May 1939 (BZ, L, SING). — S. and SE. Borneo: Martapura, near Djungun, *NIFS bb 10399*, Sept. 1926 (BZ); Tanah Bumbu, Baru, *NIFS bb 13396*, fr. Dec. 1928 (BZ, L). — E. & NE. Borneo: Sungai Dingei, *Jaheri 840*, fl. & fr. 1896—7 (BZ); Berouw, Inaran, *NIFS bb 12112*, Oct. 1927 (BZ); Kalimantan, Samarinda, Loa Duri, *NIFS bb 33706* (BZ). — Br. N. Borneo: Kabili-Sepilok For. Res., *Castro BNB 7273*, fr. June 1937 (SING).

Distribution. Borneo.

Ecology. In primary and old secondary forests at low altitude. Collected in flower in May, in fruit in May, June, and December.

Vernacular names. *Geriga, Riga, Rogung* (Dajak, Mal.); *Rakau* (Mal., Br. N. Borneo); *Simpur* (Mal.).

Notes. 1. The species is strongly characterized by the dense indument on the upper side of the petiole; by upward conduplication of the narrow petiolar wings the indument may be nearly invisible.

2. The type and the other collections of which flowers or fruits are known have a structure of the androecium as described above; a single exception is *Jaheri 840*, where the structure of the androecium is as follows: Stamens in 2 distinct groups, larger outer group (ca 165) slightly curved in bud, ca 7 mm long, smaller inner group (ca 22) with apical part reflexed outward in bud, ca 9—13 mm long. Unfortunately

the collection consists only of loose leaves and loose flowers and a young branch, from which these probably have fallen off. If more and better material is available this specimen may appear to represent a distinct variety or even species. The specimen has the typical dense indument on the upper side of the petiole and is therefore preliminarily brought to the present species.

3. The present species and the 2 preceding ones are certainly closely related. The most striking characters in common are the structure of the inflorescence and the presence of stilt-roots; the general appearance of the leaves is strikingly similar.

35. Dillenia mansoni (Gage 1906) Hoogl. comb. nov.

Wormia mansoni Gage, J. As. Soc. Beng. N. S. 2, 1906, p. 73.

Type specimen: Manson, banks of Yunzalin Riv. above its junction with the Salween, Burma, May 1905; holotype in CAL.

Evergreen, trees? Branches sympodial, younger ones ca 2 mm thick, glabrous, older ones with many lenticels. Leaf-scars clasping about $^1/_2$—$^2/_3$ of branch, subfalcate with ca 7 leaf-traces about or slightly above middle. *Leaves* oblong, 8—16 × 3—6 cm, with ca 12—16 nerves on either side; acute at apex and base, decurrent; margin dentate, nerves curving upward, ending in apex of teeth; glabrous, glossy above, glabrous on intervenium, sparsely strigose on nerves and midrib, glabrescent beneath. Petiole 7—15 mm, glabrous above, sparsely strigose, glabrescent beneath. *Inflorescences* terminal, 3—9-flowered, up to ca 15 cm long, racemes or composed by having 3-flowered lateral branch at place of 4th flower; axis 2—$1^1/_2$ mm thick, glabrous; bracts caducous, sessile, triangular, ca 12 × 4 mm, glabrous above, sparsely strigose beneath. *Flowers* ca 5 cm across. Pedicel 1—$3^1/_2$ cm, ca $1^1/_2$ mm thick at base, gradually thickened to 5 mm at apex, glabrous, without bracteoles. Sepals 5, oval, 2 outermost ones smaller (ca 10 × 8 mm) than 3 innermost ones (ca 17 × 15 mm), all glabrous inside, sparsely strigose outside, not ciliate at margin. Petals 5, white, obovate, ca 25 × 15 mm, rounded at apex, narrowed towards base. Stamens ca 85, slightly curved in bud, all of about same length (outermost ones slightly smaller), ca 6—9 mm; filament $1^1/_2$—3 mm long, flattened, ca 0.6 mm broad; anther ca 0.7 mm broad, rounded to slightly emarginate at apex; thecae linear, opening with pore near apex on outer side. Carpels 5, arranged around narrow conical receptacle, lanceolate, ca 4 × 1 mm, glabrous, each with ca 15—18 ovules; styles spreading, ca 3 mm long, ca 0.4 mm thick at base, 0.2 mm near apex. *Pseudocarps* known only immature; carpels ca 10 × 5 mm, each with 3—5 seeds. Seeds obovoid, ca 4 × 2.7 mm, with $1^1/_2$—3 mm long membranous aril.

?Assam: *Masters N 1737,* July 1845 (CAL).

Burma: Banks of Yunzalin Riv. above junction with Salween, Tenasserim, *Manson,* fl. May 1905 (CAL).

Distribution. Burma and ? Assam. The Assam specimen is sterile and referred here with some doubt.

Ecology. The type specimen was collected on a riverbank.

36. Dillenia bracteata Wight 1840

Dillenia bracteata *Wight, Ic. Pl. Ind. Or. 2, 1840, t. 358; Hook.f. & Thoms., Fl. Br. Ind. 1, 1872, p. 37; Watt, Dict. Econ. Prod. Ind. 3, 1890, p. 112; Brandis, Ind. Forester 26, 1900, p. 430; Brandis, Ind. Trees, 1906, p. 3; Gamble, Fl. Pres. Madr. 1, 1915, p. 7.

Wormia bracteata (Wight) Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 68; Drury, Handb. Ind. Fl. 1, 1864, p. 12; *Beddome, Fl. Sylv. 1, 1869, t. 115.

Type specimen: Wight 13, Peninsula Ind. Orient.; holotype in K, isotypes in CAL, GH.

Large evergreen trees. Branches sympodial, younger ones 2—3 mm thick, densely tomentose-hirsute with short yellowish hairs, glabrescent. Leaf-scars clasping about $^2/_5$—$^1/_2$ of branches, subfalcate with ca 9 leaf-traces slightly above middle, with on both sides a short single line directed lateralward. *Leaves* elliptic to oblong or obovate, (5—)10—17(—20) × (2.7—)5—10(—12) cm, with (10—)14—20 nerves on either side; slightly retuse or rounded to obtuse, sometimes slightly acuminate at apex, obtuse to acute at base, decurrent; margin slightly undulate to dentate, nerves slightly curving upward, ending in apex of teeth or otherwise in margin; sparsely shortly hirsute on intervenium, less sparsely so on nerves, rather densely so on midrib, more or less glabrescent above, slightly more densely so and less soon glabrescent beneath. Petiole 15—30(—40) mm, densely shortly hirsute, glabrescent, with non-amplexicaul, up to $1^1/_2$ mm broad wings. *Inflorescences* terminal, 2—3(—6)-flowered racemes, up to ca 7 cm long; axis ca 2 mm thick, densely hirsute like younger branches; bracts caducous, sessile, lanceolate, ca 8—12 × 3—4 mm, acute at apex, or spathulate, ca 10—17 × 4—7 mm, rounded at apex, more or less densely shortly hirsute on both sides, most densely so beneath. *Flowers* ca 9 cm across. Pedicel 4—10 mm, ca 1—$1^1/_2$ mm thick, thickened to 2—$2^1/_2$ mm at apex, densely hirsute like axis of inflorescence, without or with 1—2 caducous bracteoles; bracteoles sessile, lanceolate, ca 5 × 2 mm. Sepals 5, 2 outermost ones ovate, ca 20 × 13 mm, 3 innermost ones oval, ca 25 × 16 mm, glabrous, 2 outermost ones with 1—2 mm broad sparsely sericeous upper part inside, densely sericeous outside except in bud covered margins, which are glabrous for breadth of up to $2^1/_2$ mm, all ciliate at margin. Petals 5, yellow, obovate, ca 40 × 25 mm, rounded at apex, narrowed towards base. Stamens ca 230, slightly curved in bud, all of about same length, ca 9 mm; filament ca 3 mm long, ca 0.3 mm broad; anther ca 1.0 mm broad, rounded or slightly emarginate at apex; thecae linear, opening with pore near apex on outer side. Carpels 5, arranged around rather narrow conical receptacle, oblong, ca 6 × $2^1/_2$ mm, glabrous or hirsute with ca 0.5 mm long, rather thin, appressed hairs, mainly in upper part, each with ca 30 ovules, in lower part in 2 double rows; styles for lower 3—4 mm parallel, above this spreading, ca 9 mm long, ca 0.5 mm thick at base, 0.2 mm near apex, channelled above. *Pseudocarps* indehiscent, about globular, ca $2^1/_2$—3 cm diam. including enclosing sepals which are up to ca 30 × 20 mm; carpels ca 9 × 6 mm, each with 0—1 seeds. Seeds obovoid, ca 5 × $4^1/_2$ mm, dark reddish brown to black, arillate.

India: fl. & fr. (K); *Wight 13*, fl. (CAL, GH, K). — Malabar: Wynaad, *Beddome 41*, fl. (BM); Anaimalais, *Beddome 42*, fl. (BM); Coorg, March 1921 (DD); Chomdanthode, Wynaad Range, Manantoddy, *For. Res. Rang. 335*, fl. Feb. 1936 (DD);

ibidem, *Bor 8506 & 8507*, fl. Dec. 1937 (DD); ibidem, *For. Res. Rang.*, fr. March 1938 (DD). — Madras: Kambakan slopes, *Nagara Menon*, fl. & fr. May 1914 (K); Kambakan Hill, Chingleput Distr., *Fischer 4719*, fl. Feb. 1922 (CAL); ibidem, *Fischer 4787*, fl. Apr. 1923 (CAL).

Ceylon: *Wight*, fr. 1836 (E).

Distribution. Deccan Peninsula, known from two regions, viz. the Nilgiris on the W. coast and Kambakan Hill near Madras on the E. coast. The Ceylon record is probably due to an error.

Ecology. In forests; the altitude has been noted only once: 700 m in the Anaimalais. Flowering from December to May.

Vernacular name. *Kate gunna* (Malayalam).

Note. *Dillenia repanda* Roxb. 1832, described from Hindoostan, comes near to the present species. The description is absolutely insufficient for identification and I have seen no type specimen. If it would appear to be identic, the correct name for the present species will have to be changed. Hook.f. & Thoms. (1855) reduced it with some doubt to the present species without changing the name.

37. Dillenia hookeri Pierre 1879

Dillenia hookeri *Pierre, Fl. For. Cochinch. 1, 1879, t. 5; Laness., Pl. Util. Col. Fr., 1886, p. 281; Fin. & Gagnep., Bull. Soc. Bot. Fr. Mém. 4, 1906, p. 9; Fin. & Gagnep., Fl. Gén. Ind.-Ch. 1, 1907, p. 20; Craib, Fl. Siam. En. 1, 1925, p. 22; Gagnep., Suppl. Fl. Gén. Ind.-Ch. 1, 1938, p. 21; Hoogl., Fl. Mal. I, 4, 1951, p. 168.

Type specimen: Pierre 663, Knang Repoeu Mtn, Tpong Prov., Cambodia, June 1870; lectoholotype in P.

Evergreen trees, ca 10—15 m high, or, usually, shrubs, about 1—2 m high. Wood reddish. Branches sympodial, younger ones 3—5 mm thick, densely silky hirsute, later on hairs more appressed to glabrescent. Leaf-scars clasping about $^1/_2$ of branch, subfalcate with emarginate upper margin, with ca 13 leaf-traces about middle. *Leaves* oblong to oblanceolate, (15—)17—22(—30) × ($5^1/_2$—)7—9(—14) cm, with (22—)30—40(—45) nerves on either side; rounded, sometimes slightly acuminate at apex, acute at base, decurrent; margin entire to slightly dentate, nerves slightly curving upward, ending in apex of teeth or otherwise in margin, at apex with small tuft of hairs; rather densely velvety tomentose, most densely so on nerves, with 1—2 mm long hairs directed towards margin approximately parallel to nerves, glabrescent above, more densely velvety tomentose with hairs slightly more distant, not glabrescent beneath. Petiole $1^1/_2$—4 cm, densely sericeous, with 1(—2) mm broad, non-amplexicaul wings, in base of blade gradually narrowing into midrib. *Flowers* solitary, terminal, rarely 2 together, ca 4—5 cm across. Pedicel $1^1/_2$—4 cm, ca 2 mm thick, thickened to ca 3 mm at apex, densely sericeous with rather distant hairs, with 3 approximately verticillate bracteoles 4—8 mm below flower; bracteoles sessile, lanceolate, 20—35 × 7—10 mm, acute or often more or less truncate at apex, base slightly decurring along pedicel, with entire margin, densely silky hairy on both sides, ciliate at margin. Sepals 5—6, ovate to oval, ca 15 × 10 mm, glabrous inside, densely sericeous outside, densely ciliate at margin. Petals 5, yellow, obovate, ca 25 × 13 mm, rounded at apex, narrowed towards base. Stamens ca 190, slightly curved in bud, all of about same length, 8—10 mm; filament flattened, 3—4 mm long, ca 0.5 mm broad; anther ca 0.8 mm broad, emarginate with sharp edge at apex, incision 0.3—0.5 mm deep; thecae linear, opening with apical pore. Carpels 6—7, arranged around narrow conical receptacle, oblong, ca $5 \times 1^1/_2$ mm, glabrous, each with ca 18 ovules; styles spreading, cylindric, ca 11 mm long, 0.4—0.2 mm thick. *Pseudocarps* indehiscent, about globular, 2—$2^1/_2$ cm diam. including enclosing sepals, which are up to ca 25×14 mm; carpels ca 14×6 mm, 1—5-seeded. Seeds obovoid, ca $3^1/_2 \times 3$ mm, exarillate.

Siam: Pitsanulok: Nakawn Tai, *Kerr 5844*, fl. Apr. 1922 (BM, E, K, P). — Ubon: Ban Mawng, *Lakshnakara 912*, fl. June 1932 (BM, K). — Rachasima: Lam Nang Rawng, *Suksakorn 924*, fl. March 1920 (K). — Surat: Kanchanaclit, *Kerr 13077*, fl. Aug. 1927 (BM, K). — Puket: Satul, *Kerr 13695*, fl. Dec. 1927 (BM). — Nakawn Sritamarat: Singora, *Vanpruk 797*, fl. Nov. 1915 (K).

Indo-China: Laos: Kilo 90 de la route de Savannakhet à Quâng Tri, *Poilane 11594*, fr. Jan. 1925 (P); Paksane, Wieng Chan, *Kerr 20730*, fl. March 1932 (BM, K, P). — Cambodia: Angkor & Oudang, *Thorel 657*, fl. & fr. 1866—8 (BZ, K, P); near Knang Repoeu Mtn, *Pierre 663*, fr. March 1870 (K, P); Samrongtong Prov., *Pierre 663*, fl. March 1870 (K); near Knang Repoeu Mtn, *Pierre 663*, fl. May 1870 (A, L); ibidem, *Pierre 663*, fr. June 1870 (P); Kompong Chhnang, *Godefroy 181 (Exp. Harmand)*, fl. June 1875 (NY, P); Babaur, *Coudero*, fl. 1883—5 (P); Phou Tock, *Hahn 31* (P); *Gourgand 4, 5, & 7*, fl. 1907 (P); Pnom Penh, *d'Alleizette*, fl. June 1909 (L); Angkor, *d'Alleizette*, fl. June 1909 (L); *Magnien & Gourgand*, fl. (P); Kilo 169 route de Frimbell, *Poilane 464*, fl. Aug. 1919 (P); Kompong Chhnang, *Pételot*, fl. & fr. July 1921 (P); *Pételot 4698*, fl. (UC); between Samrong & Anlong Vehg, *Poilane 13843*, fl. (P); between La Khang Choeung & Po Bong, Sre Umbell Prov., *Poilane 15292*, fl. (P); Pnog Penh, *Béjaud 856*, fl. & fr. (P); Kadak, W of Kampot, *Poilane 27321*, fl. June 1938 (P). — Cochinchina: *Thorell 657*, fr. 1862—6 (P); *Thorell 1566*, fr. 1862—6 (BM, BR, E, G, K, NY, P); Chu Drau Mat, Saigon Prov., *Pierre 663*, fl. March 1865 (L); Baria, *Pierre 663*, fl. Dec. 1866 (P); between Tay Ninh & Soui Da, *Pierre 663*, fl. March 1867 (K); *Talmy*, fl. 1868 (P); near Lakkone, *Counillon* fl. 1890 (P); Cap St Jacques, Saigon, *Docters van Leeuwen 4810*, fl. & fr. Oct. 1920 (BZ); Saigon, *Evrard 168*, fl. & fr. Oct. 1920 (P); near Hon Quan, *Evrard 811*, fl. Apr. 1922 (P).

Malay Peninsula: Singapore: *Cantley*, fl. (SING).

Distribution. Siam, S to Satul, and Indo-China, N to ca 17° N. I do not believe that the Singapore record is reliable. The only data on the label are the collector and the printed title "Flora of Singapore".

Ecology. In deciduous forests, in savannahs, and on open grassy ground, at low altitudes.

Vernacular names. Siam: *San noi* (Siamese & Lao; Pitsanulok), *San tao* (Surat), *Sam taie* (Ubon), *San bad* (Rachasima), *Plu sabat* (Khmer). Indo-China: *Plou bat, So bac, So nho, So trang.*

Uses. The species is suitable as an ornamental shrub. The wood is sometimes used, e. g. for the manufacture of buffalo-bells (Pierre 1879). Used as a medicine against cancer? ("contre la plaie", *Hahn*).

Note. Pierre describes and figures the androecium as consisting of stamens of two different lengths; I have analysed several flowers and always found all stamens of about the same length.

38. Dillenia excelsa (Jack 1822) Gilg 1893

Wormia excelsa Jack, Mal. Misc. 2, 7, 1822, p. 69; *de Vriese, Pl. Ind. Bat. Or., 1856, p. 79, t. 6—7; *Sieb. & de Vriese, Flore Jard. Roy. Pays-Bas, 1858, p. 65 (with plate); Miq., Fl. Ind. Bat. 1, 2, 1859, p. 10; Miq., Ann. Mus. Bot. Lugd. Bat. 4, 1868, p. 76; Koord. & Val., Bijdr. 1 Booms. Java, 1894, p. 168; Moll. & Jansson., Mikr. Holz. Java Baumarten 1, 1906, p. 71; Back., Schoolfl. Java, 1911, p. 10; Koord., Exk. Fl. Java 2, 1912, p. 600; *Koord. & Val., Atl. Baumarten Java 1, 1913, f. 4; Gage & Burk., J. Str. Br. R. A. S. 73, 1916, p. 243; Corn., Gard. Bull. S. S. 10, 1939, p. 5; Corn., Wayside Trees Malaya, 1940, p. 206; Back., Bekn. Fl. Java (em. ed.) 4, 1942, fam. 80, p. 3.

Capellia multiflora Bl., Bijdr. 1, 1825, p. 5.

Wormia oblonga Wall., Cat., 1828, no 951, nomen nudum; Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 67; Miq., Fl. Ind. Bat. 1, 2, 1859, p. 11; Hook.f. & Thoms., Fl. Br. Ind. 1, 1872, p. 35; King, J. As. Soc. Beng. 58, II, 1889, p. 364; Ridl., Fl. Mal. Pen. 1, 1922, p. 9; Craib, Fl. Siam. En. 1, 1925, p. 21.

Capellenia multiflora Bl. ex Hassk., Cat. Hort. Bog. Alt., 1844, p. 178 (intended as correction for *Capellia*).

Capellenia pauciflora Zoll. & Mor., Syst. Verz. Zoll., 1845—6, p. 35.

Wormia grandifolia Miq., Fl. Ind. Bat. Suppl., 1860, p. 619.

Wormia excelsa f. grandifolia (Miq.) Miq., Ann. Mus. Bot. Lugd. Bat. 4, 1868, p. 76.

Dillenia magnoliaefolia Martelli in Becc., Malesia 3, 1886, p. 155.

Dillenia glabra Martelli in Becc., Malesia 3, 1886, p. 157; Merr., Bibl. En. Born. Pl., 1921, p. 383.

Dillenia tomentella Martelli in Becc., Malesia 3, 1886, p. 159; Merr., Bibl. En. Born. Pl., 1921, p. 383.

Dillenia mattanensis Martelli in Becc., Malesia 3, 1886, p. 160; Merr., Bibl. En. Born. Pl., 1921, p. 383.

Dillenia excelsa (Jack) Gilg in Engl. & Prantl, Nat. Pfl. Fam. 3, 6, 1893, p. 123; Merr., Bibl. En. Born. Pl., 1921, p. 383; Merr., En. Philip. Fl. Pl. 3, 1923, p. 60; Heyne, Nutt. Pl. Indon., 1950, p. 1072; Hoogl., Fl. Mal. I, 4, 1951, p. 169.

Dillenia oblonga (Wall. ex Hook.f. & Thoms.) Gilg in Engl. & Prantl, Nat. Pfl. Fam. 3, 6, 1893, p. 123.

Dillenia pauciflora (Zoll. & Mor.) Gilg in Engl. & Prantl, Nat. Pfl. Fam. 3, 6, 1893, p. 123.

Wormia pauciflora (Zoll. & Mor.) Koord. & Val., Bijdr. 1 Booms. Java, 1894, p. 169; Back., Schoolfl. Java, 1911, p. 10.

Capellia pauciflora Zoll. & Mor. ex Hook.f. & Jacks., Ind. Kew. 1, 1895, p. 415, sphalm. for *Capellenia*.

Wormia grandiflora Miq. ex Hook.f. & Jacks., Ind. Kew. 2, 1895, p. 1233, sphalm. for *grandifolia*.

Wormia tomentella (Martelli) Ridl., J. Str. Br. R. A. S. 33, 1900, p. 37; Ridl., J. Str. Br. R. A. S. 54, 1910, p. 5; Ridl., Fl. Mal. Pen. 1, 1922, p. 9; Burk., Dict. Econ. Prod. Mal. Pen., 1935, p. 2265.

Dillenia mattadensis Martelli ex Dur. & Jacks., Ind. Kew. Suppl. 1, 1902, p. 136, sphalm. for *mattanensis*.

Dillenia secunda Hunter (ed. by Ridl.), J. Str. Br. R. A. S., 53, 1909, p. 98.

Type specimens: *Wormia excelsa:* Jack, near Bencoolen, probably lost; de Voogd 503, kampong Minjak, Palembang, Sumatra, 20 Nov. 1929; neoholotype in L, isotype in BZ. — *Capellia multiflora:* Blume 1687; lectoholotype in L. — *Wormia oblonga:* Wallich 951B, Hb. Finlayer; lectoholotype in K. — *Capellenia pauciflora:* Zollinger 1021, Java; holotype in G, isotypes in BM, FI, L, P. — *Wormia grandifolia:* Diepenhorst 2509 HB, Padang an Priaman, Sumatra occ.; holotype in U, isotypes in BZ, L. — *Dillenia magnoliaefolia:* Beccari PS 548, Ajer Mantjur, Padang Prov., Aug. 1878; holotype in FI, isotypes in BM, CAL, K, L, U. — *Dillenia glabra:* Beccari PB 3940, Riv. Lingga, Sarawak, Oct. 1867; holotype in FI. — *Dillenia tomentella:* Beccari PB 1193, Kutching, Sarawak, Dec. 1865; holotype in FI, isotypes in K, M, P. — *Dillenia mattanensis:* Beccari PB 2556, Mt Mattang, Sarawak, Sept. 1866; holotype in FI, isotypes in G, K, P. — *Dillenia secunda:* Hunter, Pulau Penang; not seen.

Evergreen trees, up to 40 m high, 75 cm thick, with up to 20 m bole, dense dark green, rounded, cylindrical or pyramidal crown, without or with only slightly developed buttresses. Bark grey to brown, scurfy with reddish scales; heartwood red to dark brown. Branches sympodial, younger ones ca 3 mm thick, glabrous to sparsely strigose-hirsute or more or less densely hirsute or tomentose, glabrescent. Leaf-scars clasping about $^2/_3$

of branch, broadly to narrowly semi-lunular with ca 13 leaf-traces near lower margin, on each side horizontally diverging to slightly upward directed single line. *Leaves* subcoriaceous, elliptic to oblong, (10—)15—30(—40) × (5—)7—10(—14) cm, with (9—)10—13(—16) nerves on either side; rounded to acute, sometimes slightly acuminate at apex, acute, often unequal-sided at base, decurrent; margin slightly undulate, entire, or dentate, nerves curving upward, ending in apex of teeth or otherwise in margin; glabrous, glossy above, slightly glossy, glabrous or more or less hirsute on intervenium, glabrous to sparsely strigose, sparsely strigose-hirsute, or hirsute on nerves beneath. Petiole 2—5 cm, glabrous above, hairy like nerves beneath. *Inflorescences* terminal, racemes or composed by having second flower replaced by secondary raceme, (3—)5—8(—12)-flowered, sometimes some inflorescences crowded at end of branch-system, thereby inflorescences seemingly up to 30-flowered; axis glabrous to slightly strigose-hirsute, sparsely to densely hirsute, or sparsely to densely tomentose, 4—3 mm thick; bracts caducous, oblong-triangular, ca 10—15 × 4—5 mm. *Flowers* 7—10 cm across, with strange penetrating odour. Pedicel 2—7 cm, $1^1/_2$—2 mm thick, gradually thickened to 3—5 mm at apex, hairy like axis of inflorescence, without bracteoles. Sepals 5, oval to ovate, 20—35 × 13—16 mm, 2 outermost ones slightly smaller than 3 innermost ones, glabrous inside, glabrous to densely tomentose-hirsute with 0.2—0.5 mm long hairs except in bud covered margins which are glabrous for breadth of 1—$2^1/_2$ mm outside, often reddish, particularly in fruit, not ciliate at margin. Petals 5, bright yellow, obovate, 40—50 × 25—33 mm, rounded at apex, narrowed towards base. Stamens in 2 distinct groups, those of outer group (ca 300—320) slightly curved in bud, 10—11 mm long, those of inner group (ca 26—35) with apical part reflexed outward in bud, 16—20 mm long, generally thicker than those of outer group; filament yellow, of stamens of outer group 2—4 mm long, 0.3—0.4 mm broad, flattened, of those of inner group 3—5 mm long, 0.6—0.9 mm broad, rather thick; anther reddish to purplish, ca 1 mm broad, emarginate, often with sharp edge, at apex; thecae linear, opening with pore near apex on inner side. Carpels (5—)6—8(—10), arranged around narrow conical receptacle, lanceolate, ca 12—14 × $2^1/_2$ mm, glabrous, each with 20—25 ovules; styles spreading and recurved, pink, thickly linear, 16—20 mm long, $1^1/_2$—2 mm broad, channelled above. *Pseudocarps* dehiscent; carpels 18—20 × 12—16 mm, yellowish green outside, whitish inside, each with 1—3 seeds; seeds obovoid, ca 6 × 4 mm, dark brown with reticulate surface, with 2—3 mm long, red, membranous aril.

var. excelsa

Wormia excelsa Jack 1822. — *Capellia multiflora* Bl. 1825. — *Capellenia pauciflora* Zoll. & Mor. 1845—6. — *Dillenia magnoliaefolia* Martelli 1886. — *Dillenia glabra* Martelli 1886. — *Dillenia mattanensis* Martelli 1886. — *Dillenia excelsa* (Jack) Gilg 1893. — *Dillenia pauciflora* (Zoll. & Mor.) Gilg 1893.

Wormia excelsa var. borneensis Miq., Ann. Mus. Bot. Lugd. Bat. 4, 1868, p. 77. *Dillenia excelsa var. borneensis* (Miq.) Merr., Bibl. En. Born. Pl., 1921, p. 383.

Type specimen: *Wormia excelsa var. borneensis:* Korthals, Dusson, Borneo; holotype in L.

Younger branches glabrous to sparsely hirsute. Leaves beneath glabrous on intervenium, glabrous to sparsely strigose on nerves. Axis of inflorescences and pedicels glabrous to slightly strigose-hirsute. Sepals glabrous to slightly appressed-hairy outside.

Sumatra: *Korthals*, fl. & fr. (GH, K, L, MEL, S, U). — Sum. W. Coast: Indrapura, fl. (L); Aier Mantjur, Padang, *Beccari PS 548*, fl. Aug. 1878 (BM, CAL, FI, K, L, U); Desa Tapjing, *Koorders 10292β*, fl. Feb. 1891 (BZ); Pulau Pauh on the Kuanten Riv., *Koorders 10293β*, fl. Feb. 1891 (BZ); near Padang Tarab, *Koorders 10294β*, fl. Feb. 1891 (BZ). — Sum. E. Coast: Kuala Piasa Est., Asahan, *Yates 820*, fr. July 1923 (A, MICH, UC); Guru Batu, Asahan, *Yates 1214*, fl. Nov. 1924 (BZ, MICH, NY, P, UC); ibidem, *Yates 1306*, fr. Feb. 1925 (BZ, L, MICH, NY, P, S, UC); Serdang, Indrapura, Batu Bara, *Yates 2162*, fr. Aug. 1926 (BZ, L, MICH, NY, P, UC); Silo Maradja, Asahan, *Bartlett 8718*, fl. July 1927 (MICH, NY, US); Aer Kandis near Rantau Parapat, *Rahmat Si Toroes 2540*, fl. May—June 1932 (A, MICH, NY, UC, US); Sigamata near Rantau Parapat, Bila, *Rahmat Si Toroes 3262*, fr. June—July 1933 (A, MICH, NY, S, US); near Huta Bagasan, Asahan, *Rahmat Si Boeea 6597*, fl. & fr. Sept. 1934—Feb. 1935 (A, SING). — Palembang: Lematang Ulu, *Grashof 151*, fr. Feb. 1915 (BZ); Lematang Ilir, dusun G. Megang, *Endert 201-E-3P-966*, fl. July 1920 (BZ, K, L, WAG; transition to *var. pubescens*); ibidem, *Endert 201-E-3P-981*, fl. Jan. 1922 (BZ); ibidem, *same number*, fl. Dec. 1923 (BZ, K, L, SING, U, WAG); ibidem, *same number*, fr. Feb. 1924 (BZ, K, L, P, SING); Aerubi, N of Ranaulake, *van Steenis 3175*, fl. Oct. 1929 (BZ); Kampong Minjak, *de Voogd 503*, fl. Nov. 1929 (BZ, L); Lematang Ilir, near G. Megang, *NIFS bb 19453*, fr. Oct. 1934 (A, BZ, L). — Lamp. Distr.: Natar, *Teysmann 4259* HB, fl. (BZ, CAL, L, U); Seputih Tulangbawang, Kutabumi, *Gusdorf 181 & 182*, fr. Feb. 1914 (BZ); Telokbetong, Seputih, *Dirksen 16*, fr. Jan. 1921 (BZ); Telokbetong, near Merah Batin, *NIFS bb 5921*, fl. Nov. 1923 (BZ, L); Gunung Raté Berenong, *Iboet 238*, fl. May 1921 (BZ). — Simalur: Tapah, Dèfajan, *Achmad 1441*, fl. Oct. 1919 (BZ, K, L, P).

Malay Peninsula: Johore: Lipit Kajang, *Rahim CF 12061*, fr. Oct. 1926 (FI, SING); Danau, Sungai Sedili, *Corner*, fl. March 1932 (SING); Sungai Dohol, Mawai-Temalaung Road, *Corner SF 29335*, fl. May 1935 (A, BM, BZ, K, SING). — Singapore: *Anderson 1*, fr. Oct. 1861 (BM, CAL, E, K, MEL, P).

Java: fl. (BR, GH, L, P); *Blume*, fl. (L); *Blume 1687*, fl. (L); *Blume 1823*, fl. (L); *van Hasselt*, fl. (L); *Horsfield*, fl. (BM); *Horsfield 96*, fl. (BM); *Horsfield 719*, fr. (K); *de Vriese*, fl. (BR, K); *de Vriese 30*, fl. (L); *de Vriese & Teusmann*, fl. 1859—60 (L); *Zollinger 1021*, fl. (BM, FI, G, L, P); *Zollinger 3074*, fl. (BM, G, P). — W. Java: Kali Putjang, Tjikambulon, fl. Oct. 1871 (BZ); Tjimara, Udjung Kulon, Batuhideung Dist., *Koorders 1641β*, fl. June 1892 (BZ, CAL, K, L); Djasinga, Pasir Madang, *Backer 10333*, fl. Nov. 1913 (BZ); Bodjong Lopang, *Backer 16956*, fl. Nov. 1914 (BZ); S of Djasinga, *Backer 26022*, fl. Aug. 1918 (BZ). — C. Java: Wanaredja near Madjenang, *Backer 18548*, fl. Jan. 1915 (BZ); Madjenang, *Backer 18572*, fl. Jan. 1915 (BZ); ibidem, *Backer 18722*, fl. Jan. 1915 (BZ). — Nusa Kambangan: *Koorders 1643β*, fl. Dec. 1891 (BZ, K, L, WAG); *Koorders 1644β*, fl. Dec. 1891 (BZ, L); *Koorders 26871β*, fr. Jan. 1897 (BZ, WAG); *Koorders 26872β*, fr. (BZ); *Koorders 39277β*, fr. Sept. 1901 (BZ).

Borneo: *Korthals*, fl. & fr. (L); *Low 22*, fl. (K). — NW. Borneo: Mt Mattang, *Beccari PB 2556*, fl. Sept. 1866 (FI, G, NY, S); Lingga Riv., *Beccari PB 3940*, fl. Oct. 1867 (FI); Streep Riv., *Hewitt*, fl. June 1906 (K). — W. Borneo: Suka Lanting, *Hallier 108*, fr. 1893—4 (BZ); ibidem, *Hallier B 220*, fl. & fr. 1893—4 (BZ, L); Kuala Nusa, Kuala Kapuas, *NIFS bb 2164*, fl. Apr. 1921 (BZ, L); Sukadana, Kualan, *NIFS bb 6296*, fr. Feb. 1924 (BZ); Daun Kabesi near Selimbau, *Main 1839*, fl. Oct. 1949 (BZ); Danau Menjiban, above Bunut, *Main 2145*, fl. Oct. 1949 (BZ, L). — S. & SE. Borneo: Dusson, *Korthals*, fl. (L); Tandjong Petong, *Korthals*, fr. (L); Bandjermasin, *Motley 802*, fl. 1857—8 (CGE, K); Batang Blitang, *Teysmann 8146 HB*, fl. (BZ); Bulu Lembok, Pleihari, *NIFS bb 418*, fl. July 1918 (BZ); Pleihari, *Abdoel Rachid 1894*, fl. Feb. 1919 (BZ); Sungai Buru near Buntok, *NIFS bb 1074*, fl. Nov. 1919 (BZ); Sungai Buntok near Buntok, *NIFS bb 1148*, fl. & fr. Jan. 1920 (BZ); Danau Pamalasan, *NIFS bb 1647*, fl. & fr. Oct. 1920 (BZ); Lower Dajak, Tewai Baru, *NIFS bb 8202*, fl. & fr. March 1925 (BZ, L); Lower Dajak, Katundjung, *NIFS bb 12249*, fl. Nov. 1927 (BZ); Sampit, Terantang, *NIFS bb 13942*, fl. Nov. 1929 (BZ); Pleihari, Djorong, *NIFS bb 14166*, fr. Jan. 1930 (BZ, L). — E. & NE. Borneo: Sungai Tjetran, *Jaheri 1284*, fl. & fr. 1896—7 (BZ); Sungai Bruni, *Jaheri 1360*, fl. 1896—7 (BZ); *Jaheri 1893*, fl. (BZ); Pladju, *Amdjah 23*, fl. & fr. May 1912 (BZ); Bulungan, near Sadjau Riv., *Rutten 95*, fl. 1914 (U); W. Kutai, near Djembajan, Djembajan Riv., *Endert 1421*, fl. June 1925 (BZ, L); W. Kutai, Kimbeng, *Endert 5187*, fl. Nov. 1925 (BZ, L). — Br. N. Borneo: Kinabatangan, *Creagh*, fl. & fr. March 1895 (K); E. Coast, *Creagh*, fr. (K); *Creagh*, fr. (BM); near Lemon, Kinabalu Region, *Gibbs 2806*, fl. Jan. 1910 (BM); *Villamil 25*, fr. Aug.—Nov. 1915 (A, US); *Agama 434*, fl. & fr. May—Aug. 1917 (A, K, US); *Castillo 619*, fl. & fr. Jan.—Aug. 1919 (A); Sandakan & Vicinity, *Ramos 1379*, fl. & fr. Sept.—Dec. 1920 (A, K, P, US); Sandakan, Myburgh Prov., *Elmer 20051*, fr. Oct.—Dec. 1921 (A, BM, BZ, C, CAL, G, GH, K, L, M, MO, NY, P, S, SING, U, UC); Tawao, Elphinstone Prov., *Elmer 21159*, fl. Oct. 1922—March 1923 (A, BM, BZ, C, G, GH, K, L, M, MO, NY, P, S, SING, UC); Kinabatangan, *Arsat BNB 1052*, fr. March 1929 (A, NY); Batu Puteh, *Arsat BNB 1260*, fr. (IFI, K); ibidem, *Burut Ho BNB 1887*, fl. June 1932 (BZ, IFI, K); Marotai, *Maidin BNB 2346*, fr. Oct. 1932 (A, BZ, IFI, K); Loro, *Balajadia BNB 3722*, fl. Sept. 1933 (BZ, IFI, K); Elopura, Sandakan, Sepilok For. Res., *Castro BNB A 40*, fl. Sept. 1947 (SING; transition to *var. pubescens*); Elopura, Sandakan, Segaluid Riv., *Cuadra BNB A 1019*, fr. Nov. 1947 (SING; transition to *var. pubescens*); Elopura, Sandakan, Sepilok For. Res., *Cuadra BNB A 876*, fl. & fr. Aug. 1948 (SING; transition to *var. pubescens*); Kinabatangan Besar, *Cuadra BNB A 2147*, fl. & fr. Oct. 1948 (SING). — Banguey Isl.: *Castro & Melegrito 1719*, fr. July—Sept. 1923 (A, K, UC). — Labuan: *Maidin BNB 7330*, fl. June 1937 (SING; transition to *var. pubescens*).

Cultivated: Bot. Gard. Bogor: *Teysmann, fl.* 1860 (L); *Beccari*, 1876 (FI); *Pierre*, Nov. 1877 (P); no IV-G-20, fl. Nov. 1891 & fr. Oct. 1896 (BZ, CAL, K, L); *van Harreveld*, fl. July 1907 (GRO); Hertenkamp, *van Steenis 2278*, fl. Oct. 1928 (BZ).

Without locality: *Junghuhn 693*, fl. (L).

var. pubescens (Corn. 1939) Corn. ex Masamune 1942

Wormia oblonga Wall. ex Hook.f. & Thoms. 1855. — *Dillenia oblonga* (Wall. ex Hook.f. & Thoms.) Gilg. 1893. — *Dillenia secunda* Hunter 1909.

Wormia excelsa var. pubescens Corn., Gard. Bull. S. S. 10, 1939, p. 7, based on *Wormia oblonga* Wall. ex Hook.f. & Thoms. 1855.

Dillenia excelsa var. pubescens (Corn.) Corn. ex Masamune, En. Phan. Born., 1942, p. 463.

Younger branches sparsely to densely hirsute. Leaves glabrous on intervenium, glabrous to sparsely strigose on nerves beneath. Axis of inflorescence and pedicel sparsely to densely hirsute. Sepals more or less densely tomentose-hirsute outside.

Siam: Nakawn Sritamarat: Ban Pa Prek, Tungsong, *Rabil 173*, fr. July 1929 (BM). — Pattani: Bukit, *Kerr 7133*, fl. & fr. July 1923 (BM, E, K).

Sumatra: Atjeh: Kuala Kepong, E of Trumon, *Asdat 203*, fr. Sept. 1941 (BZ). — Sum. E. Coast: E of Lubuk Pakam, *Lörzing 3298*, fr. Oct. 1914 (BZ). — Indragiri: Lisun Kwantan Mts near Lubuk Djambi, *Buwalda 7141*, fl. Nov. 1939 (BZ). — Djambi: Sungai Lesing near Pahu, *Posthumus 1025*, fl. Oct. 1925 (BZ, L, SING). — Palembang: Bigingteluk, Riv. Rawas, *Forbes 3229*, fl. 1881 (BM, CAL, FI, GH, L, P, S); ibidem, *Forbes 3255a*, fl. 1881 (BM, CAL, DD, FI, GH, L); Banjuasin & Kubu Region, *Grashof 801*, fl. Nov. 1915 (BZ, L); Lematang Ilir, *Endert E 810*, fl. & fr. Jan. 1920 (BZ, L). — Lamp. Distr.: Menggala, *Gusdorf 53*, fl. Dec. 1913 (BZ, L).

Malay Peninsula: fl. (K); *Wallich 951B (Herb. Finlayer)*, fl. (K); *Anderson*, fl. 1863 (P); *Griffith 54a*, fl. & fr. (GH, K, P); *Scortechini*, fl. (DD, G); *Scortechini 222b*, fl. (CAL). — Kedah: Woods at Yan, *Ridley 5370*, fr. June 1893 (BM, CAL, SING); P. W. D.-Res., *Meh CF 9020*, fl. (K); Gunung Jerei, *Meh CF 9045*, fr. (K); Inchong Est., *Spare SF 37605*, fl. Aug. 1941 (BZ, SING). — Prov. Wellesley: *Ridley's Coll. 12625*, fr. Aug. 1905 (BM, SING). — Perak: fl. (BZ, UPS); Gopeng, *Kunstler 504*, fl. & fr. Aug. 1880 (CAL, FI, K, L); Larut, *Kunstler 2857*, fl. March 1882 (A, CAL); ibidem, *Scortechini 96a*, fr. Nov. 1882 (CAL); ibidem, *Scortechini 1092*, fl. July 1884 (CAL); Changkat Serdang, *Wray 735*, fl. (CAL, SING); Kampar, *Curtis 3184*, fl. & fr. Dec. 1895 (CAL, SING); Taiping, *Derry = 6257*, fl. Sept. 1898 (SING); Tapah, *Ridley 14083*, fl. Nov. 1908 (BM, SING); Changkat Mentri, S. Perak, *Kloss 6474*, fl. Sept. 1918 (K); ibidem, *Kloss 6485*, fl. & fr. Sept. 1918 (K); Kelumpang, *Somerville CF 14354*, fl. & fr. Oct. 1928 (IFI); Bidor, *Corner SF 31510*, fl. July

1936 (SING); Sungai Krian Est., *Spare SF 34568*, fl. May 1938 (BZ, L, SING). — Pahang: Pasir Loyang, *Ridley 2625*, fl. July 1891 (CAL, K, SING); Temerloh, Kuala Semantan, *Ridley 2637*, fl. Nov. 1891 (CAL, SING); Temerloh, *Hamid CF 5166*, fl. Dec. 1919 (K, SING); between Raub & Sungai Simpan, *Burkill & Haniff SF 16856*, fl. Nov. 1924 (BRI, SING); Tras road, Raub, *Kalong CF 20469*, fl. Dec. 1929 (SING); *Walker CF 14153*, fl. July 1930 (SING). — Selangor: Lubu Kelang, Kuala Lumpur, *Huting*, fl. 1890 (SING); Batu Caves, *Ridley*, fr. Dec. 1896 (SING); Kerling, *Goodenough 10623*, fr. Oct. 1899 (SING); Batu Tiga, *Ridley*, fl. Feb. 1904 (SING); Kuang, *Ridley 13388*, fl. Aug. 1908 (K, SING); Ulu Gerubah, *Burn-Murdoch*, fl. & fr. Nov. 1909 (BM); Rantau Panjang, *Kloss*, fl. July 1914 (BM); Batu Caves, *Ridley*, fr. March 1915 (BM, K); Kuala Lumpur, *Hamid CF 602*, fl. June 1916 (SING); Batu Caves, *Ridley*, fl. Dec. 1920 (K); Semempik, *Hume 8322*, fr. July 1921 (SING); Ginting Sempak, *Strugnell CF 13605*, fr. Aug. 1927 (IFI); Kanching For. Res., *Strugnell CF 13955*, fl. Sept. 1927 (SING); Sungai Lalang Kajang, *Symington CF 22936*, fl. & fr. March 1930 (IFI); Kepong Plant., *Tachun CF 16921*, fl. Apr. 1930 (IFI); ibidem, *Symington CF 32870*, fl. Nov. 1933 (DD); *Franck 1025*, fr. Sept. 1937 (C). — Negri Sembilan: Tampin, *Yakim CF 1984*, fl. June 1918 (K, SING); Linggi, *Usope CF 588*, fl. May 1919 (K, SING). — Malacca: *Griffith*, fl. (CAL, K); *Maingay 1333 (Kew Distr. 6)*, fl. 1865—6 (K); *Maingay 1333A (Kew Distr. 6)*, fl. May 1868 (CAL, GH, K, L); Sungai Udang, *Alvins 353*, fl. Dec. 1884 (SING); *Derry 46*, fl. June 1888 (K, SING); Bukit Panchor, *Derry 1025*, fl. 1892 (CAL, MEL, SING); Machap, *Goodenough 2005*, fl. May 1894 (CAL, SING). — Pulau Penang: Coast, *Curtis 257*, fl. June 1885 (K, SING); Sullok Bahang, *Lewis = 257*, fr. June 1890 (SING); ibidem, *Curtis = 257*, fr. Sept. 1890 (SING).

Borneo: NW. Borneo: Baram, *Hose 118*, fl. Nov. 1894 (K); Baram Distr., Marudi, *Hose 280*, fl. June 1895 (BM, E, K); Sampadi Hill, Sarawak sea coast, *Nat. Coll.*, fl. Nov. 1927 (UC); near Long Kapa, Mt Dulit (Ulu Tinjar), *Richards 2536*, fl. Nov. 1932 (A, K, SING). — Br. N. Borneo: Tinkayo, *Creagh*, fl. Apr. 1895 (K); Bettatan near Sandakan, *Kloss 19089*, fr. Aug. 1927 (BZ, K, SING, UC); Kabili-Sepilok For. Res., *Keith BNB 7212*, fl. May 1937 (SING); Sungai Arang, Elopura, Sandakan, *Kadir BNB A 927*, fl. & fr. Dec. 1948 (SING).

Philippines: Balabac Isl.: Cape Melville, *Fénix BS 15653*, fl. July 1912 (K)

var. tomentella (Martelli 1886) Corn. ex Masamune 1942

Dillenia tomentella Martelli 1886. — *Wormia tomentella* (Martelli) Ridl. 1900.

Wormia excelsa var. tomentella (Martelli) Corn., Gard. Bull. S. S. 10, 1939, p. 8.

Dillenia excelsa var. tomentella (Martelli) Corn. ex Masamune, En. Phan. Born., 1942, p. 463.

Younger branches tomentose-hirsute to densely shortly tomentose. Leaves on intervenium more or less densely hirsute with 0.4—1 mm long hairs, on nerves more densely hirsute beneath. Axis of inflorescences sparsely hirsute to densely tomentose-hirsute, pedicel glabrous to slightly tomentose-hirsute. Sepals glabrous to slightly appressed-hairy outside.

Sumatra: Sum. E. Coast: Simelungun, Besar Maligas, *NIFS bb 5335*, March 1923 (BZ, L). — Banka: Menumbing, *Teysmann* (BZ); Djebus, *Teysmann 3417 HB* (BZ); Muntok, Majang, *NIFS bb 7300*, Aug. 1924 (BZ).

Malay Peninsula: Johore: Sungai Kayu, Kota Tinggi-Mersing Road, *Kiah SF 32190*, fl. Oct. 1936 (K, L, SING). — Singapore: fr. (SING); fr. 1893 (SING); Selitar, *Ridley 6382*, fl. June 1894 (CAL, SING); Bukit Timah, *Ridley 6809*, fr. 1895 (BZ, SING); Changi Road, *Baker*, fl. Oct. 1917 (SING); Reservoir Jungle, *Corner & Herklots*, fl. June 1930 (SING); ibidem, *Symington CF 22979*, fr. July 1930 (SING).

Borneo: Sungei Semengoh, *Caroll 7170*, fr. Feb. 1922 (SING). — NW. Borneo: near Kuching, *Beccari PB 1193*, fl. Dec. 1865 (FI, K, M, P); ibidem, *Beccari PB 1271*, fr. Dec. 1865 (FI, K, P); Saraman, near Kuching, *Haviland 1989*, fr. Dec. 1893 (K, SING). — W. Borneo: Smittau, Pulau Madjang, *NIFS bb 7679*, Nov. 1924 (BZ); Putus-Sibau, near Punut, *NIFS bb 7700*, Nov. 1924 (BZ). — E. & NE. Borneo: E. Kutai, Muara Karangan, *NIFS bb 7966*, Dec. 1924 (BZ); W. Kutai, Bukit Lajang, *NIFS bb 16224*, Dec. 1931 (A, BZ, L); ibidem, *NIFS bb 16232*, Dec. 1931 (A, BRI, BZ, L, SING); W. Kutai, near Kelumpang, *NIFS bb 16964*, May 1932 (BZ); Bulungan, near Nunukan, *NIFS bb 26220*, July 1938 (BZ, L). — Br. N. Borneo: *Castro 977*, fl. Nov. 1920 (A, US); Beaufort, *Lupang BNB 5403*, fl. Apr. 1935 (SING).

Cultivated: Singapore: Bandstand, *Ridley*, fl. 1890 & fr. 1892 (SING); Arboretum, *Nur 1437 & 1892*, March 1918 (SING); Econ. Gard., *Mathieu*, fl. June 1918 (SING); Bandstand, *Nur*, fr. Sept. 1918 (SING); Arboretum, *Nur*, June 1924 (SING); Econ. Gard., *Deshmukh*, July 1929 (SING); Bot. Gard., *Deshmukh*, fl. (SING); Raffles College, *Corner SF 32546 & 32548*, fr. Jan. 1937 (A, BZ, K, SING).

The following specimens, of which only sterile material is available, belong either to *var. excelsa* or to *var. pubescens:*

Sumatra: Atjeh: Langsa, *NIFS bb 2575*, Jan. 1922 (BZ, L). — Tapanuli: Sibolga, Pulau Morsala near Pulau Pune, *NIFS bb 3771*, Jan. 1922 (BZ, L); Sibolga, near Pulau Pune, *NIFS bb 18698*, Aug. 1934 (A, BZ, L). — Sum. W. Coast: *Korthals* (L); Priaman, *Diepenhorst 2124 HB* (BZ); Priaman or Padang, *Diepenhorst 2509 HB* (BZ, L, U; type of *Wormia grandifolia* Miq.); Balai Selasa, Muara Sakai, *NIFS bb 5972*, Oct. 1923 (BZ); Huta Padang Est. near Kisaren, *Krukoff 271*, Dec. 1930 (BZ, NY, US). — Sum. E. Coast: Labuan Ratu Sematahari, *NIFS bb 9748*, May 1926 (BZ). — Djambi: Muara Tebo, Sei Bengkal, *NIFS bb 12796*, May 1928 (BZ). — Benkulen: Rediang, near Tabah Penandjung (Tg Serawai), *NIFS bb 1801* (BZ, L); Redjang, Taba Penandjung, Pematang Paraduan Sialang marga Djambu, *NIFS bb 2270*, July 1921 (BZ, L); Lais, near Talang Benal, *NIFS bb 8859*, March 1925 (BZ, L). — Palembang: Ogan Ulu, *Teysmann 3615 HB* (BZ, CAL); Dermo, Enim, *Teysmann 3641 HB* (BZ); Banjuasin and Kubu Region, near dusun Upang, *Thorenaar T 1138* (BZ); Muara Dua, *Grashoff 487*, July 1915 (BZ); Lematang Ilir, Keban Agung, *NIFS TB 652*, July 1922 (BZ); Lematang Ulu, Lubuk betung, *NIFS TB 654*, Dec. 1922 (BZ); Muara Dua, Kisau, *NIFS bb 9226*, March 1925 (BZ); Lematang Ulu, Geramat, *NIFS bb 8705*, Apr. 1925 (BZ); Martapura, *Bal 50*, Feb. 1930 (BZ). — Lamp. Distr.: *Zollinger 2835 HB*, Sept. 1845 (BZ); Seputih Tulangbawang, Sukadana, *Gusdorf 244*, Feb. 1914 (BZ); Tandjongkarang, *Endert E 1318*, Sept. 1920 (BZ, L); Redjosari, Natar, *Dirksen 1*, Nov. 1920 (BZ, L); Kaliandak, Kota Dalam, *NIFS bb 7998*, March 1925 (BZ, L). — Mentawei Isls: Pulau Siberut, near Simarara Kocha, *NIFS bb 17484*, Sept. 1932 (BZ, SING). — Pulau Enggano: Kiaah, *NIFS bb 19724*, June 1935 (BZ, L); Bua-Bua, *Lütjeharms 3970*, June 1936 (A, BZ, K, L, P).

Malay Peninsula: Pulau Penang: *Wallich 951, coll. by G. Porter* (K).

Java: *Blume* (L, NY); *Junghuhn* (L); *Spanoghe* (L). — W. Java: Palabuanratu, near Panumbahan, Djampangkulon, *Koorders 1640 β*, July 1890 (BZ); Palabuanratu, Songgrawa, Djampangkulon, *Koorders 1639β*, Sept. 1890 (BZ); Panggarawa, *Backer 2214*, Dec. 1911 (BZ). — Isls near SW. Bantam: Trouwersisl., *NIFS Ja 2624*, May 1933 (A, BZ, L). — Nusa Kambangan: *Koorders 1642β & 1645β*, Dec. 1891 (BZ); *Koorders 20110β*, June 1895 (BZ); *Koorders 20195β*, Oct. 1895 (BZ, P); *Koorders 20268β*, 1895 (BZ); *Koorders 24824β & 24841β*, Sept. 1896 (BZ); *Koorders 24634β*, Oct. 1896 (BZ).

Borneo: (U). — W. Borneo: Sukadana, Paib, *NIFS bb 8051*, March 1925 (BZ); Melawie, Tjatit B. Tengkujung, *NIFS bb 26040*, Sept. 1938 (BZ, L). — S. & SE. Borneo: Lower Dajak Distr., Laut Nusa (Kahajan), *NIFS bb 2104*, Feb. 1921 (BZ); Muara Tewe, Nihan Dajak, *NIFS bb 10041*, July 1926 (BZ); Puruk Tjahu, Muara Djaan, *NIFS bb 10516*, Oct. 1926 (BZ); Muara Tewe, Lau Katjang, *NIFS bb 10919*, March 1927 (BZ); Tanah Bumbu, Baru, *NIFS bb 13401*, Jan. 1929 (BZ, L). — E. & NE. Borneo: Tandjong Redeb, Labauan, *NIFS bb 11526*, June 1927 (BZ); Bulungan, Kabiran, Sungai Bengalun, *NIFS bb 11677*, July 1927 (BZ); Berau, Inaran, *NIFS bb 12086*, Oct. 1927 (BZ); W. Kutai, Bukitlajang, *NIFS bb 16174*, Nov.—Dec. 1931 (BRI, BZ, SING); W. Kutai, Djembajan (Sungai Kelesan), July 1938 (BZ, L, SING); W. Kutai, Mendoni (Sungai Klidjang), *NIFS bb 29228*, Aug. 1939 (BZ, L). — Br. N. Borneo: Kinabatangan, *Maidin BNB 1678* Feb. 1932 (K); Sandakan Batu, *Puasa 2550*, Nov. 1925 (UC).

Distribution. The species is common in Sumatra, the Malay Peninsula, and Borneo, less common in W. Java. *Var. pubescens* is exclusively found in the Malay Peninsula N of Johore and together with the other varieties in the southern part of the Malay Peninsula (Johore), Borneo, and Sumatra. Intermediates between *var. excelsa* and *var. pubes-*

cens are rather rare, though more frequent in British North Borneo. *Var. tomentella* is found mainly in the Southern part of the Malay Peninsula (Johore, Singapore), Banka, and Borneo, and is rare in Sumatra (once collected in Sumatra East Coast). *Var. excelsa* is found exclusively in Western Java, and further in Sumatra, the South of the Malay Peninsula (Johore and Singapore only), and Borneo. The only record from the Philippines (Balabac Isl. S of Palawan) belongs to *var. pubescens*.

Ecology. In forests on rather dry to swampy soil, at low altitudes.

Vernacular names. The number of vernacular names recorded for the present species is extremely high. Of the names, cited below, "*Kendikara*" has been chosen as the official name in the Bahasa Indonesia (cf. Lists of tree names, issued by the Forest Research Institute at Bogor).

Sumatra: *Ampalu* (Tapan.), *Ampalu rimbo* (Sum. W. Coast), *Bahah falah* (Simalur), *Bungah simpur* (= flower s.; Indrag.), *Enèhè* (Enggano), *Kalek Bakurok* (Tapan., Sum. W. Coast), *Nilau birrih* (Djambi), *Peileggoa* (Mentawei), *Pisang mawe* (Sum. E. Coast), *Simpur* (Djambi, Sum. E. Coast, Palemb., Benk.), *S. areng* (Lamp. Distr.), *S. ayer* (id.), *S. kiedjang* (Palemb.), *S. perampuan* (Lamp. Distr.), *S. rawang* (Palemb., Lamp. Distr.), *S. rimba* (Benk.), *S. rimbo* (Palemb.), *S. talang* (id.), *S. tjipu* (Sum. E. Coast, *S. way* (Lamp. Distr.), *Sisitue* (Atjeh). Malay Peninsula: *Kambai hutan, Penaga hlui* (Malacca), *Simpoh* (Kedah, Selangor, Johore, Penang), *S. ayer* (Perak, Pahang, Negri Sembilan), *S. padi* (Pahang), *S. pagar* (Kedah), *S. pasir* (Kuala Lumpur), *S. paya.* Banka: *Simpur lakki, S. rimba.* Java: *Djadjatian, Ki segel, Segel, Sempur segel, S. tjai* (Sundanese); *Drègèl, Sempur batu, Sempu lanang, Wuru* (Javanese); *Simpur* (Malay). Borneo: *Alung-alung* (Dajak, Punan), *Djamihing* (Malay, Bondarese), *Djelangin* (Tidung., Batajan), *Djengin* (Malay, Berauw), *Djiing, Djochin* (Daj.), *Gara* (Dajak, Kapuas), *Kadjamihing* (Dajak, Kapuas; Malay, Sampit), *Kajuringin, Kandikara* (*Kendikara, Kendikkara*) (Malay, Kutinese), *Kanigara* (*Kenigara, Kaligara*) (Bandjarese, Bondarese, Malay), *Kegihing, Urib* (Dajak), *Pampan* (Dusun Rungus), *Randaman* (Banggi), *Ringin* (Dajak), *Simporotan* (Malay, Br. N. Borneo), *Simpur* (id.), *S. bukit* (Malay, Sarawak), *S. laki* (Malay; Sarawak, Brunei, and Sandakan), *Tjidahura, Tjumihing* (Dajak, Siangese).

Uses. The wood, though of rather bad quality, is sometimes used in house-building.

Note. The varieties, which were distinguished by Corner (1939) and which I have retained here differ in the following characters: *var. pubescens* differs by the dense indument on the outer side of the sepals, *var. tomentella* by the indument on the lower side of the leaves; the character of the indument on other parts is of less importance. Intermediates between *var. excelsa* and *var. pubescens* are known; *var. excelsa* represents the generally more glabrous plants.

39. Dillenia luzoniensis (Vidal 1886) Martelli ex Dur. & Jacks. 1902

Wormia luzoniensis Vidal, Revis. Pl. Vasc. Filip., 1886, p. 36; Elm., Leafl. Philip. Bot. 7, 1915, p. 2622.

Tetracera borneensis Auct. non Miq.; Rolfe, J. Bot. 23, 1885, p. 209; Vidal, Revis. Pl. Filip., 1886, p. 36.

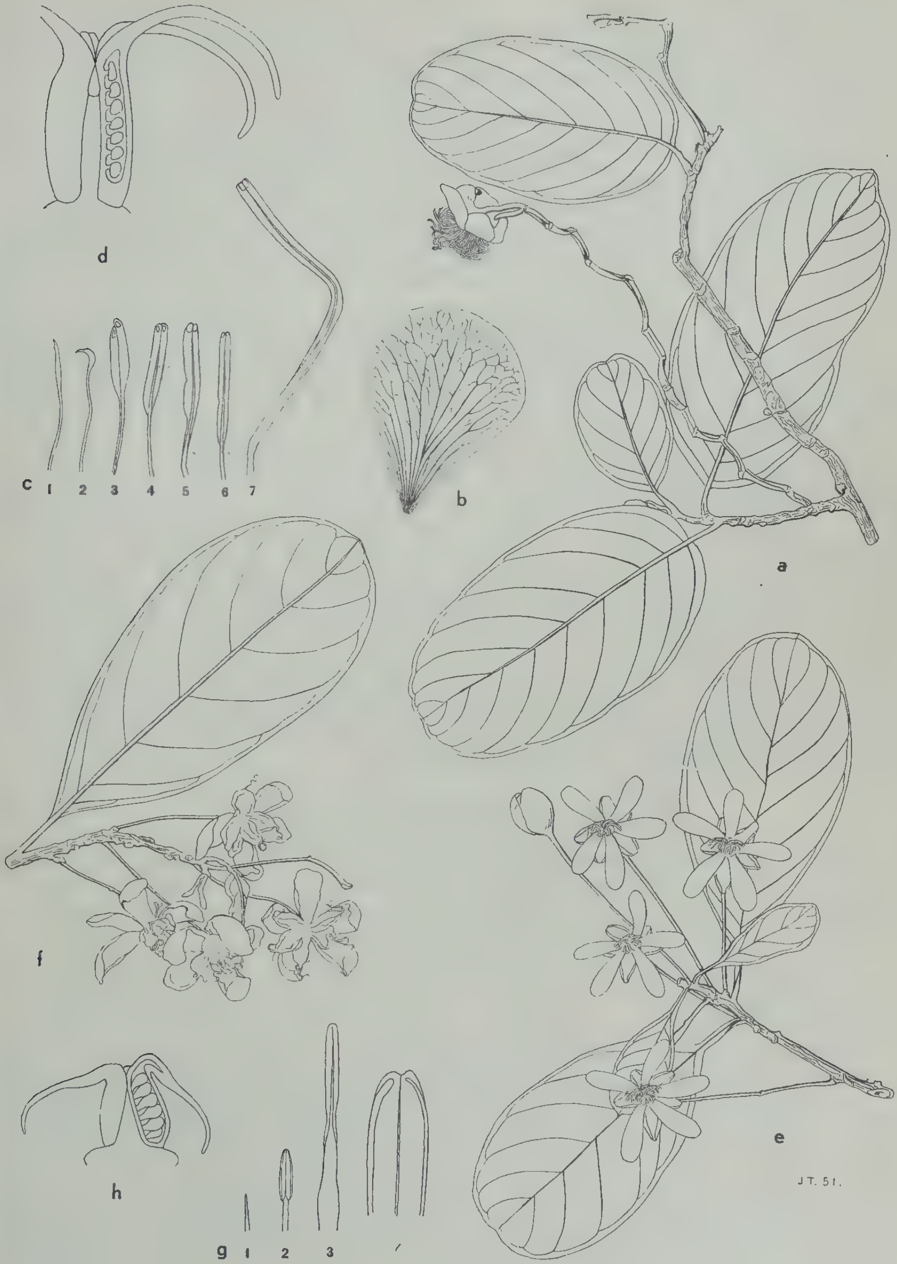
Dillenia luzoniensis (Vidal) Martelli ex Dur. & Jacks., Ind. Kew. Suppl. 1, 1902, p. 136; Merr., Philip. J. Sc. 1, Suppl., 1906, p. 95; Merr., En. Philip. Fl. Pl. 3, 1923, p. 60, p. p.; Hoogl., Fl. Mal. I, 4, 1951, p. 168.

Type specimen: Comision de la Flora Forestal de Filipinas 3, Zambales, Luzon; lectoholotype (isotype) in L, isotypes in Fl, K.

Fig. 10 a—d, p. 95.

Evergreen trees. Branches sympodial, younger ones ca $1^{1}/_{2}$ mm thick, shortly strigose to entirely glabrous, glabrescent, older ones with grey bark. Leaf-scars clasping about $^{1}/_{2}$ of branch, semi-lunular with sharp depression in upper margin, with ca 10 leaf-traces near or slightly below middle. *Leaves* subcoriaceous, oval to oblong, (3—)6—15(—20) × (2—)3—7(—11) cm, with (4—)6—12(—15) nerves on either side; rounded to slightly emarginate at apex, rounded at base; margin entire to slightly emarginate at end of nerves, nerves curving upward, bifurcate near margin, one fork towards margin, second fork along margin, anastomising with next nerve; glabrous on both sides or sparsely strigose on midrib and basal part of nerves beneath. Petiole $^{1}/_{2}$—1 cm, glabrous above, glabrous to shortly strigose beneath, with ca 1 mm broad, non-amplexicaul wings. *Inflorescences* terminal, racemes with only one flower open at a time and soon falling fruits, continuously growing and thus lateral, leaf-opposed on older defoliate branches; axis distinctly zigzag, up to 40 cm long, with up to 30 scars of fallen flowers, lower internodes longer (3—4 cm) than upper ones (0.6—1 cm), very shortly strigose like younger branches; bracts caducous, triangular, with ca 4 mm broad base clasping about half of axis, ca 7 mm long, obtuse at apex, glabrous above, shortly strigose, most densely so near middle and towards apex, beneath, finely and shortly ciliate at margin. *Flowers* ca 6—8 cm across. Pedicel 2—$2^{1}/_{2}$ cm, $1^{1}/_{2}$ mm thick, slightly thickened to 2 mm at apex, shortly strigose, without bracteoles. Sepals 5, oval, 15—18 × 10—14 mm, glabrous inside, shortly appressedly silky hairy outside, finely and shortly ciliate at margin. Petals 5, yellow, obovate, 40—50 × 30—40 mm, rounded at apex, narrowed towards base. Stamens in 2 distinct groups, those of outer group (ca 120) slightly curved in bud, 8 mm long, those of inner group (ca 50) with apical part reflexed outward in bud, 14—20 mm long; outside outer stamens often some (ca 6) staminodes, linear, 7 mm long; filament of outermost stamens ca 5 mm long, gradually diminishing to 2 mm towards centre; anther ca 0.8 mm broad, rounded to emarginate at apex, sometimes with very small mucro at end of connective; thecae linear, opening with pore near apex on inner side. Carpels 7—8, arranged around narrow conical, nearly cylindric receptacle, lanceolate, ca 8 × $2^{1}/_{2}$ mm, glabrous

Fig. 10 — a, b, c, d. *Dillenia luzoniensis* (Vidal) Dur. & Jacks. (p. 93); a. branch with relatively young (above, with young bud) and older (below, on older defoliate branch, with open flower from which the petals have fallen off) inflorescence, × ½; b. petal, × ½; c. 1—2: staminodes, 3—6: stamens of outer group, 7: stamen of inner group, × 2½; d. gynoecium, longitudinal section, × 2½; all after *Elmer 12906*; e, f, g, h. *Dillenia pulchella* (Jack) Gilg (p. 113); e. flowering branch, × ½; f. fruiting branch, × ½; g. 1: staminode, × 2½, 2: stamen of outer group, × 2½, 3: stamen of inner group, × 2½, 4: apex of stamen of outer group, × 12½; h. gynoecium, longitudinal section, × 2½; e, g, and h after *CF 939*, f after *Lela CF 2677*.


d
c 1 2 3 4 5 6 7
b
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e
J T. 51.
h
g 1 2 3

to rather sparsely shortly hirsute, each with ca 16 ovules; styles spreading, linear, ca 10 mm long, 1/2 mm broad, channelled above. *Pseudocarps* dehiscent, when ripe sepals pink, enlarged to ca 25 × 15 mm; carpels 17 × 14 mm, each with 1—2 seeds. Seeds obovoid, ca 3 × 2 mm, black, with membranous, up to 5 mm long aril.

Philippines: Palawan: Isl. of Paragua, *Vidal 2026 & 2035*, fr. resp. fl. (K); Inhurt Set, *Curran FB 3475*, fr. Jan. 1906 (K, P, US); *Foxworthy BS 549*, fl. March—Apr. 1906 (BZ, K, NY, US); Puerta Princesa, Mt Pulgar, *Elmer 12906*, fl. March 1911 (A, BM, BZ, CAL, E, FI, G, GH, K, L, MO, NY, P, U); *Danao FB 21574*, fl. Apr.—May 1914 (K, P, US); Lapulapu, Iwahig PC., *Edaño PNH 208*, fl. March 1947 (A, L); Victoria Mts, Panacan, Aborlan, *Sulit PNH 12289*, fl. & fr. May 1950 (A). — Luzon: Zambales, *Com. Fl. For. 3*, fl. (FI, K, L); Bagac, Bataan, *Com. Fl. For. 940*, fl. & fr. (FI, L).

Distribution. Philippines, known only from Palawan and W. Luzon. It is remarkable that since Vidal collected the species in Luzon (Zambales and Bataan Provinces) it has never been rediscovered in that island.

Ecology. In forests on riverbanks at low altitude.

Vernacular names. Of the vernacular names mentioned by Merrill (1923) the following ones may belong here: *Atpúi* (Tagb.), *Malakatmón* (Kuy.), *Malaliring* (Neg.). The other names probably refer to *D. diantha.*

Notes. 1. Merrill (1923) cited under the present species a number of specimens belonging to *D. diantha*; the latter species is found only in Luzon.

2. In general appearance of the leaf the present species strongly resembles *D. diantha* and *D. monantha*; from the former it is easily distinguished by the non-amplexicaul petiolar base and leaf-scar, from the latter by the structure of the inflorescence.

40. Dillenia blanchardii Pierre 1879

Dillenia blanchardii *Pierre, Fl. For. Cochinch. 1, 1879, pl. 14; Laness., Pl. Util. Col. Fr., 1886, p. 282; Fin. & Gagnep., Bull. Soc. Bot. Fr. Mém. 4, 1906, p. 10; Fin. & Gagnep., Fl. Gén. Ind.-Ch. 1, 1907, p. 23; Gagnep., Suppl. Fl. Gén. Ind.-Ch. 1, 1938, p. 23.

Wormia blanchardii (Pierre) Gilg & Werderm. in Engl. & Prantl, Nat. Pfl. Fam. ed. 2, 21, 1925, p. 25.

Type specimen: Pierre 2042 (= Harmand 652), Poulo Condor, Aug. 1876; holotype in P, isotypes in P.

Evergreen trees, up to ca 20 m high, 100 cm thick, with up to ca 10 m bole, with tortuous branches. Bark brown; heartwood red. Branches sympodial, younger ones ca 1 1/2—2 mm thick, glabrous to very sparsely shortly strigose, glabrescent. Leaf-scars clasping about 3/5 of branch, subfalcate with ca 7—9 leaf-traces about or slightly below middle, with on both sides ca 1 mm long slightly upward directed single line. *Leaves* elliptic-oblong to obovate, (4—)8—15(—18) × (1.8—)3—7(—8 1/2) cm, with (7—)9—12(—14) nerves on either side; slightly retuse or rounded to obtuse at apex, rounded at base, decurrent; margin entire to slightly undulate, nerves curving upward, not reaching margin, in upper part of leaf vein towards margin; glossy, glabrous on both sides. Petiole (0.6—)1—2(—3) cm, glabrous, with 1/2—1 1/2 mm broad non-amplexicaul wings. *Inflorescences* terminal, usually 2-, rarely 1- or 3-flowered racemes, up to ca 5 cm long; axis ca $1^1/_2$ mm thick, glabrous; bracts caducous, elliptic, somewhat concave, ca 6 × 3 mm, glabrous above, strigose beneath. *Flowers* ca 6 cm across (estimated). Pedicel $1^1/_2$—4 cm, ca 1 mm thick, thickened to 4 mm at apex, glabrous, without bracteoles. Sepals 5, oval, 16—20 × 8—12 mm, glabrous inside, sparsely shortly hirsute outside, ciliate at margin. Petals 5, yellow, unknown to me. Stamens ca 170, outermost ones slightly curved in bud, ca 10 mm long, innermost ones with apical part reflexed outward in bud, ca 15 mm long, with many of intermediate lengths, shortest most numerous; filament $2^1/_2$—4 mm long, in outer ones ca 0.4—0.5, in innermost ones up to 1.0 mm broad; anther ca 0.7—1.0 mm broad, truncate at apex; thecae linear, opening with apical pore. Carpels 5—7, arranged around narrow conical receptacle, oblong, ca 6 × $1^1/_2$ mm, glabrous, each with ca 12—15 ovules; styles recurved, ca 10 mm long, ca 0.7 mm thick at base, 0.2 mm near apex, channelled above. *Pseudocarps* probably indehiscent, oval, ca 25—30 × 15—18 mm including enclosing sepals which are 28—32 × 15—17 mm; carpels ca 14 × 7 mm, each with 0—1 seed. Seeds reniform, ca $4^1/_2$ × $3^1/_2$ mm, dark brown, enclosed by fleshy aril.

Indo-China: Annam: Nha Trang & Vicinity, *Robinson 1266*, fl. March 1911 (K, NY, P); ibidem, *Robinson 1479*, fl. March 1911 (K, NY, P, US); Húi han heo near Nhatrang, *Poilane 4802*, fl. & fr. Sept. 1922 (P); Mère et l'Enfant, near Nhatrang, *Poilane 5130*, fr. Nov. 1922 (P); near Nhatrang along road to Ninh-Hoa, *Poilane 8356*, fl. Oct. 1923 (P); E of Cana (S. Annam), *Evrard 2405*, fl. Nov. 1925 (P); Cana, Prov. of Phanrang, *Poilane 17849*, fl. July 1930 (P). — Cochinchina: Poulo Condor, *Harmand 652 (= Pierre 2042)*, fr. Aug. 1876 (P).

Distribution. Indo-China, known only from Annam and Poulo Condor.

Ecology. In forests; as to altitude are noted 300 m (*Poilane 5130*) and 1200 m (*Evrard 2405*).

Vernacular names. *Cáy sô* and *So nho.*

Uses. The wood is suitable for beams.

41. Dillenia sumatrana Miq. 1860

Dillenia sumatrana Miq., Fl. Ind. Bat. Suppl., 1860, p. 620; Hoogl., Fl. Mal. I, 4, 1951, p. 170.

Dillenia meliosmifolia Hook.f. & Thoms., Fl. Br. Ind. 1, 1875, p. 36; Fin. & Gagnep., Bull. Soc. Bot. Fr. Mém. 4, 1906, p. 10; Ridl., J. Str. Br. R. A. S. 54, 1910, p. 7; Ridl., Fl. Mal. Pen. 1, 1922, p. 12; Craib, Fl. Siam. En. 1, 1925, p. 23; Burk., Dict. Econ. Prod. Mal. Pen., 1935, p. 810; Corn., Gard. Bull. S. S. 10, 1939, p. 3; Corn., Wayside Trees Malaya, 1940, p. 204; *Watanabe, Ill. Comm. Med. Pl. South. Regions, 1942, p. 244; Heyne, Nutt. Pl. Indon., 1950, p. 1072. (orthography usually *meliosmaefolia*).

Wormia meliosmifolia (Hook.f. & Thoms.) King, J. As. Soc. Beng. 58, II, 1889, p. 365; *King, Ann. Roy. Bot. Gard. Cal. 5, 1896, p. 115, t. 130.

Wormia parviflora Ridl., J. Str. Br. R. A. S. 54, 1910, p. 6; Ridl., Fl. Mal. Pen. 1, 1922, p. 9.

Dillenia elmeri Merr., Univ. Calif. Publ. Bot. 15, 1929, p. 195.

Type specimens: *Dillenia sumatrana:* 454 HB, Lubukalung, Sum. W. Coast; holotype in U, isotypes in BZ, L. — *Dillenia meliosmifolia*; Griffith 51, Malacca; holotype in K. — *Wormia parviflora:* Curtis, Ayer Panas, Malacca, May 1900; lectoholotype in SING. — *Dillenia elmeri:* Elmer 21028, Tawao, Elphinstone Prov., Br.

N. Borneo, Oct. 1922—March 1923; holotype in UC, isotypes in BM, BZ, C, G, GH, K, L, M, MO, NY, P, SING, U.

Rather tall, slender, evergreen trees, up to 20 m high, 35 cm thick, with up to 6 m bole. Bark reddish brown. Branches sympodial, younger ones $1^1/_2$—3 mm thick, moderately to densely hirsute with 0.3—1.5 mm long hairs, glabrescent. Leaf-scars clasping about $^1/_2$ of branch, semilunular to subfalcate with ca 11 leaf-traces slightly above middle. *Leaves* oblong, (13—)16—30(—45) × (5—)7—16(—20) cm, with (13—)15—20 (—26) nerves on either side; acute to acuminate at apex, acute to obtuse at base; margin dentate to nearly entire, nerves usually slightly curving upward, ending in apex of teeth with short mucro; slightly shining, glabrous to sparsely hirsute on intervenium and nerves, glabrous to densely hirsute on midrib above, dull, glabrous to slightly hirsute on intervenium, slightly to rather densely strigose-hirsute on nerves, rather densely to densely strigose-hirsute on midrib beneath. Petiole $1^1/_2$—5 cm, glabrous to densely hirsute above, sparsely strigose, particularly near base, to densely hirsute beneath. *Inflorescences* terminal; flowers solitary or in 2(—3)-flowered racemes with flowers attached close to each other; axis 0.1—2(—5) cm long, $2^1/_2$—$1^1/_2$ mm thick, densely hirsute like younger branches; bracts caducous, lanceolate, 6—20 × 1—4 mm, densely hirsute on both sides, most densely so above. *Flowers* ca 6 cm across. Pedicel 1—3 cm, when in fruit prolonged to 2—5 cm, 1.3—2 mm thick, thickened to $2^1/_2$—3 mm at apex, moderately to densely hirsute like younger branches, without bracteoles. Sepals 5, ovate, 10—14 × 9—11 mm, glabrous except up to 5 mm broad densely shortly sericeous margin near apex inside, densely sericeous outside, densely ciliate at margin. Petals 5, yellow, obovate, ca 25 × 15 mm, rounded at apex, narrowed towards base. Stamens yellow, in 2 distinct groups, those of outer group (ca 200) slightly curved in bud, 6—$7^1/_2$ mm long, those of inner group (ca 18—20) with apical part reflexed outward in bud, 10—11 mm long; filament 2—$3^1/_2$ mm long, in stamens of outer group 0.1—0.3, in those of inner group 0.2—0.4 mm broad; anther 0.5—0.7 mm broad, in stamens of outer group rounded with often bifurcate mucro at apex, in those of inner group slightly mucronate to slightly emarginate. Carpels 7—10, white, arranged around narrow conical receptacle, lanceolate, ca 4—5 × $1^1/_2$ mm, glabrous, each with ca 15—20 ovules; styles spreading, white, linear-lanceolate, flat, 5—6 mm long, up to 0.8 mm broad, with acute apex. *Pseudocarps* indehiscent, yellow or orange-yellow, about globular, 2—$2^1/_2$ cm diam. including enclosing sepals which are up to 25 × 20 mm, up to $2^1/_2$ mm thick at base; carpels coriaceous, ca 12 × 7 mm, each with 1(—2) seeds. Seeds oval, ca 5 × $3^1/_2$ mm, glossy black, exarillate.

Sumatra: Sum. E. Coast: near Badjalinggi S of Tebingtinggi, *Lörzing & Jochems 7603*, 1920 (BZ); Bila (Aek Buro), *Lörzing 11585*, fr. Apr. 1925 (BZ); Silo Maradja, Asahan, near Talun Djoring, *Rahmat Si Toroes 828*, fl. July—Aug. 1928 (A, MICH, SING); Huta Padang Est. near Kesarin, *Krukoff 298*, Dec. 1930 (BZ, NY, US); Masihi For. Res., Asahan, *Krukoff 4047*, fl. Oct.—Nov. 1932 (A, BRI, BZ, G, L, MO, NY, SING, US); near Huta Bagasan, Asahan, *Rahmat Si Boeea 1055*, fl. Sept. 1934—Feb. 1935 (A, S, SING); ibidem, *Rahmat Si Boeea 6616*, fl. Sept. 1934—Feb. 1935 (A, SING, US); near Aek Salabat, Asahan, *Rahmat Si Boeea 9628*, fl. July 1936 (A). — Lamp. Distr.: Gunung Trang, *Forbes 1607*, fr. Aug. 1880 (BM, CAL, GH, SING). — Pulau Bras: near Laping, *Koorders 10505β*, Feb. 1890 (BZ). — Pulau

Simalur: *Achmad 1076,* fl. Apr. 1919 (BZ, L). — Pulau Nias: near Sibolga, *NIFS bb 5713,* fl. May 1923 (BZ). — Mentawei Isls: Siberut, *Kloss SF 14083,* fr. Sept. 1924 (BM, BZ, K, SING, UC); ibidem, *Iboet 106,* fl. Sept. 1924 (BZ, L).

Malay Peninsula: *Scortechini,* fl. (BZ, K, L, UPS); *Scortechini 1910a,* fl. (CAL, DD, P). — Perak: Gopeng, *Kwnstler 858,* fr. Oct. 1880 (BM, CAL, DD); ibidem, *Kunstler 4779,* Aug. 1883 (BM, CAL, E, K, L, SING); Chanderiang, *Kunstler 5787,* fr. March 1884 (BM, CAL, K, L, SING); Jura, *Kunstler 8151,* fl. Sept. 1885 (CAL, FI, UPS); Ulu Bubong, *Kunstler 10175,* fl. Jan. 1886 (CAL, G, L, US). — Dindings: Bukit Tungal, *Ridley,* fr. March 1896 (SING); Lumut, *Curtis = 3489,* fl. Dec. 1902 (SING). — Pahang: Chatin, Temerloh, *Hamid CF 4773,* fr. Aug. 1919 (K, SING); Temerloh, *Bonar CF 6326,* fl. Oct. 1925 (K, SING); Kawansul For. Res., *Hamid CF 10686,* fl. (IFI); Raub, *Kalong CF 20295,* fl. Oct. 1929 (IFI). — Selangor: Kuala Lumpur, *Curtis 2311,* fr. July 1890 (SING); Bukit Etam, Kuala Lumpur, *Kelsall 1847,* fr. Jan. 1891 (BM, CAL, SING); Ulu Gombak, *Burn-Murdoch 132,* fl. 1908 (BM); Weld's Hill, *Hamid CF 969,* fl. Apr. 1917 (SING); ibidem, *Rahman CF 1801,* fl. Jan. 1918 (SING); ibidem, *Ahmad CF 3898,* fl. July 1919 (K); Sungai Lalang Kajang, *Symington CF 22863,* fr. March 1930 (IFI); Bangi Kajang, *Osmar & Tachun CF 23660,* fr. Dec. 1930 (IFI); Rantau Panjang, *Barnard CF 29057,* fr. Feb. 1932 (DD). — Negri Sembilan: Gunung Angsi, *Ridley,* fr. Dec. 1898 (SING); Bangi, Kajang For. Res., *Ahmad CF 5194,* fr. Feb. 1920 (K, SING); Bukit Tangga, *Ridley,* fl. Dec. 1920 (K); Senaling Inas For. Res., *Holttum SF 9757,* fr. Nov. 1922 (BZ, K, SING); Gunung Angsi For. Res., *Ali CF 23679,* fl. (IFI); Gunung Angsi, *Franck 353,* Aug. 1937 (C). — Malacca: *Griffith 51,* fr. (K); *Maingay 1298 (Kew Distr. 7),* fl. July 1865—6 (K); Bujong, *Scortechini 1910,* fr. March 1883 (CAL); *Alvins 161,* fr. Nov. 1884 (SING); Selandar, *Alvins 676,* fr. Jan. 1885 (SING); Sedanau Res., *Derry 380,* fr. Nov. 1889 (MEL, SING); Merlimau, *Derry 1077,* fl. Oct. 1892 (CAL, P, SING); *Goodenough 1500,* fr. Oct. 1893 (K, SING); Ayer Panas, *Goodenough 1983,* fl. June 1894 (BM, SING); Ayer Kroh, *Ridley,* 1899 (SING); S. side of Selandar For., *Burkill SF 1357,* fr. Dec. 1915 (K, SING).

Borneo: NW. Borneo: Kayangeran For. Res., Lawas, *Omar 82,* fr. June 1924 (SING) — Br. N. Borneo: *Villamil 240,* Sept.—Oct. 1916 (K); Tawao, Elphinstone Prov., *Elmer 21028,* fr. Oct. 1922—March 1923 (BM, BZ, C, G, GH, K, L, M, MO, NY, P, SING, U, UC).

Cultivated: Singapore: Changi, *Baker 5843,* fl. Oct. 1917 (G); ibidem, *Baker 5570,* fr. Nov. 1917 (G); Econ. Gard., *Deshmukh,* fl. Aug. 1919 (SING); ibidem, *Deshmukh,* fr. May 1921 (SING); ibidem, *Henderson SF 1347,* fl. Sept. 1921 (SING).

Distribution. Sumatra and some of the adjacent islands (Pulau Bras, Simalur, Nias, and Siberut), Malay Peninsula (not in the southernmost part), and Borneo (known only from Sarawak and British North Borneo).

Ecology. In forests, up to 500 m altitude.

Vernacular names. Sumatra: *Dwasa hupang, Kaju si marbadji bodat, Kaju hatapang dolok* (Sum. E. Coast); *Duwa saopang* (Toba Mal.); *Surumah delok* (Simalur). Malay Peninsula: *Simpoh bukit* (= hill-s.), *S. hutan* (= woodland s.), *S. jantan* (= big s.), *S. padi* (= little s.). Borneo: *Simpoh gunang* (Sarawak).

Uses. The fruit is eaten. The wood is of rather bad quality, but sometimes used in house-building.

42. Dillenia sibuyanensis (Elm. 1913) Merr. 1914

Wormia sibuyanensis Elm., Leafl. Philip. Bot. 5, 1913, p. 1772.

Dillenia sibuyanensis (Elm.) Merr., Philip. J. Sc. Bot. 9, 1914, p. 332; Merr., En. Philip. Fl. Pl. 3, 1923, p. 62; Hoogl., Fl. Mal. I, 4, 1951, p. 170.

Type specimen: Elmer 12078, Magallanes, Mt Giting-Giting, Capiz Prov., Isl. of Sibuyan, March 1910; lectoholotype (isotype) in L, isotypes in A, BM, BZ, CAL, E, FI, G, GH, K, MO, NY, P, US.

Evergreen shrubs, 3 m high or higher, with numerously rebranched branches. Bark smooth, greyish brown, when old scaling off in plates. Wood moderately hard and heavy, sappy white, odourless, with a slight sweet taste. Branches sympodial, younger ones 1—$1^{1}/_{2}$ mm thick, glabrous to sparsely hirsute, glabrescent. Leaf-scars clasping $^{1}/_{3}$—$^{1}/_{2}$ of branch, broadly subfalcate with ca 7 leaf-traces in lower half. *Leaves* rigidly chartaceous, narrowly obovate to oblanceolate, (2—)$3^{1}/_{2}$—6(—9) × ($^{1}/_{2}$—)1—2(—3) cm, with (5—)7—9(—10) nerves on either side; acuminate at apex, acute at base, decurrent; margin entire to very slightly emarginate at end of nerves; nerves curving upward, ending $^{1}/_{2}$—1 mm from margin, with secondary nerve towards margin; shining, deep green, glabrous above, dull, much lighter green, glabrous on intervenium, sparsely strigose on nerves, with hairy domatia in axil of nerves beneath. Petiole 5—16 mm, glabrous above, glabrous to sparsely strigose beneath, sparsely ciliate at margin near base. *Inflorescences* terminal; flowers solitary or in 2—3-flowered racemes; axis ca 3 cm long, ca 1 mm thick, hairy like younger branches; bracts caducous, lanceolate, acuminate. *Flowers* ca 5 cm across. Pedicel $^{1}/_{2}$—3 cm, ca 1 mm thick, thickened to ca 2 mm at apex, sparsely hirsute. Sepals 7—9, oval to obovate, outermost ones smaller (ca 12 × 7 mm) than innermost ones (ca 15 × 10 mm), glabrous inside, slightly hirsute outside, sparsely ciliate at margin. Petals 5, lemon yellow, narrowly obovate, ca 30 × 13 mm, rounded at apex and base. Stamens in 2 distinct groups, those of outer group (ca 70) slightly curved in bud, 7—8 mm long, those of inner group (ca 20) with apical part reflexed outward in bud, 12—16 mm long; filament of outer stamens of outer group 2—3 mm long, ca 0.2 mm broad, that of inner stamens of outer group and of those of inner group $1^{1}/_{2}$—2 mm long, ca 0.5 mm broad; anther 0.6—0.8 mm broad, emarginate at apex; thecae linear, opening with pore near apex on outer side. Carpels (5—)7(—8), bright red, arranged around narrow conical receptacle, lanceolate, ca 6—8 × 1.5—1.8 mm, glabrous, each with 6 ovules; styles spreading, whitish, linear, ca 12 mm long, 1 mm broad near base, 0.3 mm near apex, acute at apex. *Pseudocarps* dehiscent; carpels ca 15 × 10 mm, each 1-seeded. Seeds obovoid, ca 3.5 × 2.8 mm, brown, enclosed by yellow, membranous aril.

Philippines: Sibuyan: Magallanes, Mt Giting-Giting, *Elmer 12087*, fl. & fr. March 1910 (A, BM, BZ, CAL, E, FI, G, GH, K, L, MO, NY, P, US).

Distribution. Philippines, Sibuyan Island only.

Ecology. Scattered along forested river banks from about sea level to 300 m.

43. Dillenia retusa Thunb. 1791

Arbor zeylanica fructu acidulo Godhapara dicta Herm., Mus. Zeyl., 1717, p. 49; Burm., Thes. Zeyl., 1737, p. 30.

Dillenia integra *Thunb., Trans. Linn. Soc. 1, 1791, p. 199, t. 18; DC., Syst. 1, 1818, p. 437; DC., Prod. 1, 1824, p. 76.

Dillenia retusa *Thunb., Trans. Linn. Soc. 1, 1791, p. 200, t. 19; DC., Syst. 1, 1818, p. 437; DC., Prod. 1, 1824, p. 76; Wight & Arn., Prod. Fl. Pen. Ind. Or. 1, 1834, p. 6; Hook.f. & Thoms., Fl. Br. Ind. 1, 1872, p. 37; Trim., Handb. Fl. Ceyl. 1, 1893, p. 13; Gamble, Man. Ind. Timb. 2nd ed., 1902, p. 5; Gamble, Fl. Pres. Madras 1, 1915, p. 7; Abeyesundere & Rosayro, Draft of 1st Checkl. Ceyl., 1939, p. 18; Dougl. & Baas Becking, Bull. Bot. Gard. Btzg III, 17, 1947, p. 298.

Wormia integra (Thunb.) Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 68.

Wormia retusa (Thunb.) Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 68.

Dillenia retusa var. integra (Thunb.) Boerl., Cat. Hort. Bog., 1899, p. 7.

Type specimens: *Dillenia integra:* herb. Thunberg, Ceylon; holotype in UPS, original of Thunberg's figure, not seen. — *Dillenia retusa:* idem.

Evergreen trees, up to ca 20 m high, 70 cm thick. Bark brownish grey, wood reddish brown. Branches sympodial, younger ones $1^1/_2$—2 mm thick, more or less densely appressed silky hairy, glabrescent. Leaf-scars clasping about $^2/_5$—$^1/_2$ of branch, semi-lunular with 9 leaf-traces in middle. *Leaves* obovate, ($8^1/_2$—)13—18(—21) × (5—)$7^1/_2$—10(—12) cm, with 10—14 nerves on either side; rounded to retuse at apex, acute at base, decurrent; margin entire to slightly dentate, nerves ending in apex of teeth or otherwise in margin; shining, glabrous above, rather dull, glabrous on intervenium, sparsely strigose on nerves and midrib beneath. Petiole 1.3—2.2 cm, glabrous above, densely to sparsely strigose beneath. *Inflorescences* terminal, usually 2—3-, rarely 1-flowered, with 2—4 cm long axis with flowers usually attached close to each other, with triangular bracts, 4—8 × 1—2 mm, often small bud, ca 2 × 1 mm, at apex between 2 pedicels or next to single pedicel, never seen developing further. *Flowers* 6—8 cm across. Pedicel 1—$3^1/_2$ cm long, 0.7—1.5 mm thick, slightly thickened to $2^1/_2$ mm at apex, sparsely strigose to sparsely hirsute, without bracteoles. Sepals 5, circular to oval, 2 outermost ones smaller (ca 16 × 14 mm) than 3 innermost ones (ca 20 × 20 mm), up to $2^1/_2$ mm thick at base, all glabrous inside, rather densely appressedly silky hairy outside, most densely so on central part from base upward, 3 innermost ones more densely so than 2 outermost ones, all densely ciliate at margin. Petals 5, white, obovate, ca 35 × 25 mm, rounded at apex, narrowed towards base. Stamens ca 180, outermost ones slightly curved in bud, ca $6^1/_2$ mm long, innermost ones with apical part reflexed outward in bud, ca 11 mm long, with several of intermediate lengths; filament purple, whitish towards base, in outermost stamens ca 2, in innermost ones ca 3 mm long, all ca 0.8 mm broad; anther 0.5—0.8 mm broad, acuminate at apex; thecae white, linear, opening with pore near apex on outer side; connective purple. Carpels 5—6, arranged around broad conical receptacle, lanceolate, ca 8 × $2^1/_2$ mm, glabrous, each with 22—34 ovules in 2 double rows; styles spreading, cylindric, 7—8 mm long, 0.4 mm thick near base, 0.2 mm near apex, channelled above, acute at apex. *Pseudocarps* indehiscent, orange, about globular, 2—3 cm diam. including enclosing sepals which are up to 45 × 40 mm, at base up to 8 mm thick; carpels ca 13 × 8 mm, each with many seeds. Seeds ovoid, ca $2^1/_2$ × 2 mm, exarillate.

India: "Penins. Ind. Or.", *Rottler* (K); idem, *Wight 23*, fl. (GL, K).

Ceylon: Colombo, *Berkett 963*, fl. (MEL); Calte, *Champion*, fl. Apr. (CGE); *Kelaart*, fl. (K); *Walker*, fl. (G); *Walker 55* (G); *Wight*, fl. March 1836 (E); *Thwaites CP 2960*, fl. Sept. 1864 (BM, BZ, CAL, CGE, G, GH, K, MEL, P); forest of Achmimené, *de Poli*, fl. Apr. 1879 (P); *Rudolf*, fl. Feb. 1896 (MICH); Elpikya, *Pearson 935*, 1897 (CGE).

Cultivated: Bot. Gard. Peradeniya: *Detch*, fl. & fr. May 1922 (A); *Dir. of Agric.*, fl. March 1925 (IFI). — Bot. Gard. Calcutta: fl. (BZ, C, CAL, DD, U); *Voigt*, fr. (C); *Anderson*, fl. (CAL, K); *Wallich 6625a*, fl. July 1807 (CGE, K); fl. 1848 (OX); *Pierre*, fl. Apr. 1863 (P); *Kurz*, fl. (BZ, CAL); *Mayr*, fr. 1866—7

(A, M). — Bot. Gard. Bogor: fl. (CAL); *Beccari*, fl. 1876 (FI); no IV-G-22, fr. Aug. 1890 (BZ, K, L); no IV-G-28, fl. Nov. 1889, fr. Oct. 1896 & Apr. 1912 (BZ, K, L, U); no XII-B-IX-53, fl. (BZ).

Locality unknown: fl. (P); *Brandis*, fl. (DD); *Dahl* (S); *Helfer* (P); *de Hügel*, fl. 1829 (M); fl. Apr. 1884 (CAL).

Distribution. Ceylon; also reported from the Deccan Peninsula, but this is probably due to misidentification of *D. bracteata*. The specimens, cited under India above, are not reliable as to their geography.

Ecology. In Ceylon rather common in moist low country; known in flower from April to September.

Vernacular name. *Godapara* (Singhalese).

Use. The fruit is edible.

44. Dillenia monantha Merr. 1914

Dillenia monantha Merr., Philip. J. Sc. Bot. 9, 1914, p. 321; Merr., En. Philip. Fl. Pl. 3, 1923, p. 60; Hoogl., Fl. Mal. I, 4, 1951, p. 170.

Type specimen: Merrill 9237, Taytay, Palawan, Apr. 1913; lectoholotype (isotype) in L, isotypes in A, BM, BZ, CAL, GH, K, MO, NY, P, SING.

Evergreen trees, up to 17 m high. Bark smooth. Branches sympodial, younger ones ca 2 mm thick, glabrous to very shortly strigose, glabrescent. Leaf-scars clasping about $^2/_5$ of branch, semi-lunular with 5—7 leaf-traces near lower margin, with on both sides single line, 1—1$^1/_2$ mm long, diverging slightly upward to slightly downward. *Leaves* elliptic-oblong to lanceolate, (3$^1/_2$—)8—14(—17) × (1.8—)3$^1/_2$—7(—8$^1/_2$) cm, with (5—)7—9(—11) nerves on either side; rounded to obtuse, rarely acute at apex, obtuse to acute at base, decurrent; margin slightly undulate-dentate, nerves curving upward, ending in margin either directly or through ca 1 mm long vein; shining on both sides, most so above, glabrous above, glabrous on intervenium and nerves, glabrous to sparsely very shortly strigose on midrib beneath. Petiole 5—12(—25) mm, 2.4—4(—5) mm broad including 1—1$^1/_2$ mm broad wings, glabrous above, glabrous to sparsely very shortly strigose beneath. *Flowers* solitary, terminal, ca 10 cm across. Pedicel 2$^1/_2$—5(—7) cm, 1$^1/_2$—2 mm thick, thickened to 5 mm at apex, glabrous to sparsely very shortly hirsute, without bracteoles. Sepals 5, oval, 2 outermost ones smaller (ca 15 × 12 mm) than 3 innermost ones (ca 22 × 15 mm), glabrous on both sides, glabrous to ciliate at margin. Petals 5, yellow, obovate, ca 50 × 28 mm, rounded at apex, narrowed towards base. Stamens ca 110, outermost ones slightly curved in bud, ca 9 (some to 7) mm long, innermost ones with apical part reflexed outward in bud, up to 15 (some to 17) mm long, size gradually increasing towards centre of flower, stamens of 9 and 15 mm represented by largest number; filament 2—3 mm long, 0.4—0.5 mm broad; anther ca 0.7 mm broad, rounded at apex; thecae linear, opening with pore near apex on outer side. Carpels 4—5, arranged around narrow conical receptacle, lanceolate, ca 7—8 × 1$^1/_2$ mm, glabrous to sparsely hirsute with 0.2—0.4 mm long, rather rigid hairs, each with 11—16 ovules; styles slightly spreading, linear, ca 8 mm long, 0.2—0.4 mm broad. *Pseudocarps* dehiscent; sepals spreading, enlarged to ca 35 × 17 mm; carpels ca 15 × 13 mm, each with 1 seed. Seeds obovoid, ca 4 × 2$^1/_2$ mm, with ca 1 mm long membranous aril.

Philippines: Palawan: Dumaran, Paragua Prov., *Vidal 1098*, fr. (K); *Curran FB 4518*, fl. June 1906 (L, US); Taytay, *Merrill 9237*, fl. Apr. 1913 (A, BM, BZ, CAL, GH, K, L, MO, NY, P, SING); *Escritor BS 21555*, fl. Aug. 1913 (K, US); Dumaran, *Escritor BS 21642*, fl. Aug. 1913 (P); Taglupa, *Alcacid PNH 6016*, fl. May 1938 (A); Binohan Mtn near Puerta Princesa, *Ebalo 401*, fl. Feb. 1940 (A). — Calamianes: Culion, *Fénix BS 15647*, fl. July 1912 (BM, K); Busuanga, *Ramos BS 41245*, fl. Sept. 1922 (A, K, P); Culion, *Herre 1010*, fl. Apr. 1931 (A, NY, UC); ibidem, *Bartlett 15541*, fl. & fr. July 1935 (A).

Distribution. Philippines, known only from Palawan and the Calamianes.

Ecology. In dry secondary forests and in open grasslands at low altitudes.

Vernacular names. *Malacatmon* (Tag.).

Note. In general appearance of the leaf the species strongly resembles *D. luzoniensis* and *D. diantha*; from the former it is easily distinguished by the solitary flowers, from the latter by the non-amplexicaul petiolar wings and ditto leaf-scars.

45. Dillenia turbinata Fin. & Gagnep. 1906

Dillenia turbinata *Fin. & Gagnep., Bull. Soc. Bot. Fr. Mém. 4, 1906, p. 11, pl. 1; *Fin. & Gagnep., Fl. Gén. Ind.-Ch. 1, 1907, p. 23, pl. 1; Merr., Philip. J. Sc. 21, 1922, p. 502; Merr., Lingn. Sc. J. 5, 1927, p. 128; Gagnep., Suppl. Fl. Gén. Ind.-Ch. 1, 1938, p. 23; Masamune, Fl. Kainantensis, 1943, p. 205.

Dillenia heterosepala *Fin. & Gagnep., Bull. Soc. Bot. Fr. Mém. 4, 1906, p. 11, pl. 2; *Fin. & Gagnep., Fl. Gén. Ind.-Ch. 1, 1907, p. 24, pl. 2; Merr., Lingn. Sc. J. 9, 1930, p. 40; Gagnep., Suppl. Fl. Gén. Ind.-Ch. 1, 1938, p. 24; Masamune, Fl. Kainantensis, 1943, p. 205.

Type specimens: *Dillenia turbinata:* Bon 5299, Lac Thô, Tonkin Occ., 1892; holotype in P. — *Dillenia heterosepala:* Bon 5421, Thien Thou, Tonkin Occ., 11 June 1892; holotype in P.

Evergreen trees, up to 30 m high, 1 m thick. Bark grey or greyish green. Branches sympodial, younger ones 3—5 mm thick, densely ferrugineous-hirsute, glabrescent. Leaf-scars clasping about $^{1}/_{2}$ of branch, subfalcate with ca 15 leaf-traces in upper half. *Leaves* obovate, (6—)15—30(—40) × (3$^{1}/_{2}$—)8—14(—18) cm, with (9—)15—22(—40) nerves on either side; rounded to obtuse, rarely acute at apex, acute at base, decurrent; margin dentate to nearly entire, nerves ending in apex of teeth; deep green, glabrous on intervenium and nerves, densely shortly hirsute on midrib above, pale green, sparsely hirsute on intervenium, rather densely so on nerves and midrib beneath. Petiole 2—3(—4$^{1}/_{2}$) cm, slightly winged with up to 1$^{1}/_{2}$ mm broad, non-amplexicaul wings; glabrous above, hirsute to nearly glabrous beneath. *Inflorescences* terminal, 2—4-flowered racemes, 1$^{1}/_{2}$—7 cm long; axis 5—3 mm thick, densely hirsute like younger branches, without bracts. *Flowers* 10—13 cm across. Pedicel 3—20 mm, 2—3 mm thick, densely hirsute like axis, without bracteoles. Sepals 5, oval, 2 outermost ones slightly larger (ca 35 × 20 mm) than 3 innermost ones (ca 32 × 18 mm), glabrous except upper margin of ca 5 mm breadth in 2 outermost ones inside, hairy except in bud covered margins outside, indument rather densely villose in 2 outermost ones, densely appressedly sericeous in 2 innermost ones, in third sepal partly like in outermost, partly like in innermost ones; densely ciliate at margin. Petals 5, bright yellow or, rarely, white or pink, obovate, 55—

70×35—45 mm, rounded at apex, narrowed towards base. Stamens in 2 distinct groups, those of outer group (ca 310—325) slightly curved in bud, 14—18 mm long, those of inner group (ca 25) with apical part reflexed outward in bud, 20—25 mm long; filament purplish red, of stamens of outer group 5—11 mm long, 0.4—1 mm broad, of those of inner group 2—5 mm long, 1—$1^{1}/_{2}$ mm broad; anther in stamens of outer group for whole length 0.8—1.0 mm broad, in those of inner group 0.8 mm broad at apex, up to 2.0 mm at base by broadening of connective towards base, slightly emarginate at apex in stamens of inner group and innermost ones of outer group, to manifestly acuminate in outermost stamens; thecae yellow, linear, opening with pore near apex on outer side; connective purplish red. Carpels 8—9, white, arranged around rather narrow conical receptacle, lanceolate, 8—10×3—$3^{1}/_{2}$ mm, glabrous, each with ca 40—45 ovules, in lower part in 2 double rows; styles spreading, cylindric, ca 13 mm long, ca 0.8 mm thick near base, 0.4 mm near apex. *Pseudocarps* indehiscent, dull red or red, about globular, ca 5 cm diam., $4^{1}/_{2}$ cm high including enclosing sepals which are up to $6 \times 4^{1}/_{2}$ cm; carpels ca 17×8 mm, each with 1 or more seeds. Seeds obovoid, ca 6×4 mm, glossy dark brown, glabrous, exarillate.

China: Kwangsi: Ma Hou Ho, Sup Man Ta Shan, *Liang 69570*, fr. July 1937 (A); Shan Pi Pa Muk, Shap Man Taai Shan, Tang Lung village SE of Shang-sze, *Tsang 23992*, fr. Aug. 1934 (A, MO, NY). — Hainan: *Henry 8622*, fr. 1889 (K); *Konishi 21959*, fr. June 1909 (UC); *Chun 6494*, fl. March 1920 (UC); Yik Tsok Mau, Fan Ya, *MacClure 9275*, fl. Apr. 1922 (A, BM, E, G, K, MO, P); Sai Young Pi Ba Shue, Tai Shui Kau, Lin Fa Shan & Vicinity, Lam Ko Distr., *Tsang 15730*, fr. July 1927 (A, G, K, NY, S, UC); Sai Ip Pei Pa Shue, Lin Fa Shan (Taam Chau-Lam Ko Distr.), *Tsang 17025*, fr. May 1928 (A, K, MO, P, UC); Po-ting, Nam Lung Shaan, *May 97*, Aug. 1928 (UC); Hung Mo Tung, Hung Mo, above Fan Ta, *MacClure & Fung 18288*, Aug. 1929 (A, DD, K, NY); E of Po-ting, Ling Shui, *Ko 52211*, fr. Apr. 1932 (A, K, NY, P); Way to Seven Finger Mts, *Liang 61621*, fl. Apr. 1932 (A, K, NY); between Paai Poon Ts'uen and Fan Maan Ts'uen, Ling Shui Distr., *Fung 20079*, fl. & fr. May 1932 (A, BM, E, G, K, MO, NY, P, UC); Yaichow, *How & Chun 70272*, fl. March 1933 (A, E, K, NY, P); Tai Wong Ling & Vicinity, Tung Pin Tin village, Ching Mai Distr., *Lei 461*, fl. March 1933 (A, K, L, NY, P, SING, UC); Yaichow, *How 70391*, fl. March 1933 (NY); Ping Pa, Ue Lung Ling, Ch'ang-kiang Distr., *Lau 1439*, fl. May 1933 (A, BM, NY, P); Pak Shik Ling & Vicinity, Ku Tung village, Ching Mai Distr., *Lei 715*, fr. June 1933 (BZ, K, L, NY, P, SING, UC); Yaichow, *How 70953*, fr. July 1933 (A, NY, P); ibidem, *Liang 62040*, fr. July 1933 (A, NY); *Wang 32976*, fl. July 1933 (NY); *Wang 36660*, fl. Jan. 1934 (A, NY); Shan Ping Pa, Chim Fung Ling, near Sam Mo Watt village, Kamp-en Distr., *Lau 3687*, fl. Apr. 1934 (A, P, S); Po-ting, *How 71792*, fr. Apr. 1935 (A); ibidem, *How 72058*, fr. Apr. 1935 (A); ibidem, *How 72084*, fl. (BZ, G); ibidem, *How 72444*, fr. May 1935 (SING); Yeung Lam Shan, near Yeung Lam village, Yai-hsien Distr., *Lau 6260*, fr. May 1935 (A); Bak Sa, *Lau 25919*, fl. March 1936 (A).

Indo-China: Tonkin: Lac Thô, *Bon 5299*, fl. 1892 (P); Thien Thòu, *Bon 5421*, fr. June 1892 (P); Chan Mong For. Res., Phu Tho Prov., *Fleury 30126*, fl. Apr. 1914 (P); Hui La For. Res., Tuyen Quang Prov., *Fleury 37429*, fl. May 1918 (P); between Vinh Yen and Ban Dao, *Pételot 4581*, fl. Apr. 1931 (NY, P); Su Poul Sis Links, Vinh Yen Prov., *Pételot 5470*, fr. May 1935 (A, P); Lan Hit, Thai Nguyen Prov., *Pételot 2401*, fl. May 1940 (A, NY, MO). — Annam: Bogiang, Thua Thien Prov., *Eberhardt 2779*, fl. (P); Co Ba (Ke Nhe) For. Res., Nghe An (Vinh) Prov., *Chevalier 32544*, fr. May 1914 (P); Hon Ba massif, Nha Trong Prov., *Chevalier 38602*, fr. Aug. 1918 (P); Beu Tiam, Quang Tri Prov., *Poilane 1126*, March 1920 (P); Bana near Tourane, *Poilane 1582*, fr. June 1920 (P); ibidem, *Poilane 7253*, fr. July 1923 (P); ibidem, *Poilane 7274*, fr. July 1923 (P); Lien Chien near Tourane, *Poilane 7581*, fr. Aug. 1923 (P); between Nhatrang and Ninh Hoa, *Poilane 8248*, fr. Oct. 1923 (P);

Dent du Tigre, Quang Tri Prov., *Poilane 10395*, fr. May 1924 (P); Dong Co Pat massif, Quang Tri Prov., *Poilane 11139*, fr. July 1924 (P); Mt Bani near Tourane, *Clemens 3916*, fr. July 1927 (P, UC); ibidem, *Clemens 4120*, fl. May—July 1927 (A, K, NY, P, UC); P. Sapoum near Blao, Haut Donai Prov., *Poilane 22044*, fl. & fr. Feb. 1933 (P); ibidem, *Poilane 23794*, fl. Jan. 1935 (P); Bana near Tourane, *Poilane 29297*, fr. March 1939 (P); Poste 6, Quang Nam Prov., *Poilane 29570*, fl. March 1939 (P); Hui Baih Ma Station near Hué, *Poilane 29764*, fl. Apr. 1939 (P); ibidem, *Poilane 29874*, fl. & fr. Apr. 1939 (P).

Distribution. S. China (Kwangsi and Hainan) and Indo-China (Tonkin and Annam), S to ca 15° N.

Ecology. Usually in dense forests, often in ravines, rarely in open places; most common at medium altitudes (in Annam 500—1200 m), descending to 300 m and probably lower. Flowering from January to July, fruiting to August.

Vernacular names. Hainan: *Pai (Pei, Pi) Pa Shu* (Ching Mai Distr.), *Baai Tui* (Lai dialect). Indo-China: *Cay Long, Cay long tia, Cay so, Cay tro* (Annamite); *Co sanh manh* (Muong); *Po bua* (Loi); *Ta vaci* (Moi).

Uses. The fruit is edible; the wood is suitable for beams.

Notes. 1. In most specimens where the colour of the petals has been noted they are said to be yellow; white and pink both have been noted once (*Lau 1439* and *Tsang 23992* resp.).

2. *Poilane 8248* and *23794* are referred here with some doubt. The number of nerves is higher than usual in the species, viz. ca 35 in *Poilane 8248* and ca 40 in *Poilane 23794*. Though the material is insufficient, it further matches the species reasonably.

46. Dillenia ovata Wall. ex Hook.f. & Thoms. 1855

Dillenia ovata Wall., Cat., 1828, no 945, nomen nudum; Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 70; Miq., Fl. Ind. Bat. 1, 2, 1859, p. 12; Hook.f. & Thoms., Fl. Br. Ind. 1, 1872, p. 36; *Pierre, Fl. For. Cochinch. 1, 1879, t. 10; Laness., Pl. Util. Col. Fr., 1886, p. 282; King, J. As. Soc. Beng. 58, II, 1889, p. 366; Fin. & Gagnep., Bull. Soc. Bot. Fr. Mém. 4, 1906, p. 10; Fin. & Gagnep., Fl. Gén. Ind.-Ch. 1, 1907, p. 22; Back., Fl. Batavia 1, 1907, p. 5; Back., Schoolfl. Java, 1911, p. 11; Koord., Exk. Fl. Java 2, 1912, p. 601; *Crev. & Lemarié, Cat. Prod. Ind.-Ch. 1, 1917, p. 191, pl. 65; Ridl., Fl. Mal. Pen. 1, 1922, p. 11; Craib, Fl. Siam. En. 1, 1925, p. 23; *Crev. & Pétel., Bull. Econ. Ind.-Ch. Nouv. Sér. 32, 1929, p. 19; Burk., Dict. Econ. Prod. Mal. Pen. 1, 1935, p. 810; Gagnep., Suppl. Fl. Gén. Ind.-Ch. 1, 1938, p. 23; Corn., Wayside Trees Malaya, 1940, p. 204; Back., Bekn. Fl. Java (em. ed.) 4, 1942, fam. 80, p. 5; Hoogl., Fl. Mal. I, 4, 1951, p. 170.

Dillenia aurea Auct. non Sm.; J. Schmidt, Bot. Tidskr. 32, 1916, p. 334.

Type specimen: Wallich 945, G. Porter, Penang; holotype in K.

Evergreen trees, up to 30 m high, 100 cm thick, usually smaller, ca 6—12 m high, 30—40 cm thick, with rather knotted trunk; crown lowly attached, leaving up to 5 m bole. Bark reddish or brown, flaky. Branches sympodial, younger ones ca 3 mm thick, densely hirsute, most densely so in axil of leaves, glabrescent. Leaf-scars clasping about $^1/_2$ of branch, subfalcate with ca 13 leaf-traces somewhat above middle. *Leaves* ovate to oval or elliptic, (7—)10—20(—30) × (5—)7—12(—15) cm, with (14—)18—25(—30) nerves on either side, in young trees and on saplings 30—60 × 14—18 cm, ca 50-nerved; rounded to obtuse, in young trees and on saplings to acute, at apex, rounded to acute, often unequal-sided at base; margin entire to obscurely dentate, nerves ending in margin or apex of teeth; sparsely hirsute on intervenium, rather densely so on nerves, densely so on midrib above, tomentose-hirsute on intervenium, slightly more densely so on midrib and nerves beneath; often small tuft of hairs at apex of nerves at margin. Petiole (2—)3—$4^{1}/_{2}$ cm, densely hirsute. *Flowers* solitary, terminal, ca 16 cm across. Pedicel 5—9 mm, 2—3 mm thick, thickened at apex to 5—6 mm, densely hirsute, with 2 bracteoles above middle; bracteoles caducous, sessile, lanceolate, lower one larger (ca 10 × 4 mm) than upper one (ca 6 × 2 mm), densely hirsute. Sepals 5, oval, 2 outermost ones ca 25—30 × 20—27 mm, 3 innermost ones narrower, ca 25—30 × 16 mm, up to 5 mm thick at base; glabrous inside, hairy except in bud covered margins outside, indument rather densely villose in 2 outermost ones, densely appressed sericeous in 2 innermost ones, in third sepal partly like in outermost ones, partly like in innermost ones; densely ciliate at margin. Petals 5, lemon yellow, obovate, $6^{1}/_{2}$—$7^{1}/_{2}$ × 5—6 cm, rounded at apex, narrowed towards base. Stamens in 2 distinct groups; those of outer group (ca 450—480) slightly curved in bud, 16—20 mm long, those of inner group (ca 26) with apical part reflexed outward in bud, ca 25 mm long; filament flattened, that of stamens of outer group 4—12 mm long, 0.4—0.8 mm broad, of those of inner group 3—6 mm long, 1—2 mm broad; anther in outermost stamens of outer group for whole length 0.7—0.9 mm broad, in inner stamens of outer group 0.8 mm broad at apex, up to 1.5 mm at base by broadening of connective towards base, slightly emarginate to mucronate with up to 0.5 mm long mucro, with largest mucro in outermost stamens, at apex, in stamens of inner group 0.8 mm broad at apex, up to 2.0 mm at base, emarginate at apex; thecae linear, opening with pore near apex on outer side. Carpels (8—)10(—12), arranged around conical receptacle, lanceolate, ca 6—7 × 2—$2^{1}/_{2}$ mm, glabrous, each with ca 50 ovules, in lower part in 2 double rows; styles spreading, yellowish white, filiform, ca 20 mm long, at base ca 0.8 mm thick. *Pseudocarps* indehiscent, dull yellow, appressed globular, ca 6 cm diam., $4^{1}/_{2}$ cm high including enclosing sepals, which are ca 75 × 55 mm, up to 15 mm thick at base; carpels ca 22 × 10 mm, each with 1—7 seeds embedded in glutinous pulp. Seeds obovoid, ca 5 × 4 mm, glossy dark brown, glabrous, exarillate.

Siam: Ta Uten, Nakawn Pahan, *Kerr*, fl. Feb. 1924 (BM). — Pitsanulok: Nakawn Tai, *Kerr 5869*, fr. Apr. 1922 (BM, K). — Udawn: Kao Keo Kang, Dan Sai, *Kerr 5803*, Apr. 1922 (BM, K); Pu Tong, Loi, *Kerr 8847*, fl. March 1924 (BM, K); Kao Krading, Loi, *Kerr 20081*, fl. Feb. 1931 (BM); ibidem, *Lakshnakara 1377*, fl. (BM, K). — Ubon: Sangka, Surin, *Kerr 8272*, fl. Jan. 1924 (BM, E, K); Surin, *Put 649*, fl. Feb. 1927 (BM). — Rachasima: Lam Nang Rawng, *Suksakorn 935*, fl. March 1920 (K). — Chantaburi: Kaw Chang, Klong Son, *Schmidt 417*, fl. Feb. 1900 (C, M, S); ibidem, *Schmidt 648*, fr. Feb. 1900 (C); Baw Rai, Krat, *Kerr 9519*, fr. Dec. 1924 (BM); Kaw Chang, Lem Dan, *Rabil 22*, fr. June 1925 (BM, K); W of Kao Sabab, *Seidenfaden 2763*, Feb. 1935 (SING). — Prachinburi: Sriracha For., Nong Kaw, *Collins 152*, fr. Aug. 1913 (K); ibidem, *Collins 349*, fl. Feb. 1914 (K); ibidem, *Collins 517*, fl. Sept. 1917 (BM, K); Nong Yai Boo, *Collins 713*, fr. March 1921 (K); Sriracha For., *Collins 812*, fr. Apr. 1922 (K); Nah Prow, Sriracha, *Collins 858*, fl. March 1923 (K); Nong Nain Khea, Sriracha For., *Collins 1130*, fr. March 1926 (K, US). — Nakawn Sritamarat: Na Wong, Patalung, *Kerr 15330*, fl. Apr. 1928 (BM).

Indo-China: *Pierre*, fr. (A); *Poilane*, fr. (P). — Laos: Kilo 20 road from Savannakhet to Quang Tri, *Poilane 11822*, fl. Jan. 1925 (P); near Savannakhet, *Poilane*

12073, fl. March 1925 (P). — Annam: Nha Trang, *Krempf*, fr. (P); Lang Buin massif between Klou & Danhine, *Chevalier 30935*, Feb. 1914 (P); Lang Vai, Quang Tri Prov., *Poilane 1287*, fl. Apr. 1920 (P); Ca Na, Phanrang Prov., *Poilane 5817*, fl. March 1923 (P); Massif de la Mère et l'Enfant, Nhatrang Prov., *Poilane 6694*, fr. May 1923 (P); Hué & Vicinity, *Squires 320*, fl. Jan.—May 1927 (A, BM, BZ, K, P, UC); Dalat & Vicinity, *Squires 775*, fl. March—Apr. 1932 (A, BM, BR, BZ, G, K, M, MO, NY, P, S, SING); near Djiring, Haut Danai Prov., *Poilane 24678*, fl. March 1935 (P); Col d'Ailao, Quang Tri Prov., *Poilane 30065*, fr. July—Aug. 1939 (P); Tang Phan For., *Müller 1971*, fr. Aug. 1939 (P); near Beuméthuot, Darlac Prov., *Poilane 32373*, fr. Apr. 1941 (P). — Cambodia: fr. (P); *Simond* (P); Mt Srangui, *Pierre 725* (P); Pen Lovier, *Pierre 767*a, fl. March 1870 (CAL, P); Mt Knang Krepoeu, *Pierre 767b*, May 1870 (K, P); Mt Dom Reck, *Harmand 296 (= Pierre 2046)*, fl. July 1876 (NY, P); Kamchai near Kampot, *Hahn 126*, fl. Feb. 1896 (P); near Pnom Kumchieg, Kampot Prov., *Chevalier 31753*, fl. March 1914 (P); Pursah, *Chevalier 31988*, fl. March 1914 (P); *Béjaud 486*, May 1929 (A, NY, P); Pnom Penh, *Béjaud 487*, fl. (P); Izgbam, *Thung v. Dieu 76*, fr. Aug. 1931 (P); Kadak W of Kampot, *Poilane 27324*, fr. June 1938 (P); Mio Xang Bo, Mimat, *Müller 300*, July 1938 (P). — Cochinchina: *Talmy 6* (P); *Thorell 968*, fl. & fr. 1862—6 (K, P); Thu Drau Mat, *Pierre 2038*, fl. March 1865 (P); Bao Chiang, Bien Hoa Prov., *Pierre 2038*, fl. Sept. 1865 (K, P); Ben Xuc, Thu Drau Mat Prov., *Pierre 2037*, fl. & fr. Apr. 1866 (P); Cay Cong, Tay Ninh Prov., *Pierre 2040*, fl. Apr. 1866 (A, P); base of Cau Thi Vai Mtn, Baria Prov., *Pierre 2039*, fr. Dec. 1866 (K); Mu Xoai, Dinh Mts, Baria Prov., *Pierre 144*, fl. March 1867 (P); Poulo Condor, *Harmand 855 (= Pierre 2046)*, fl. Oct. 1876 (K); Phu Quoc, *Pierre 1799*, fl. Feb. 1877 (P); Tau Dinh For., Bienhoa Prov., *Vinot 29*, fl. Feb. 1912 (P); Trang Bom For. Res., Bienhoa Prov., *Fleury 30084*, fl. March 1914 (P); Giaray, Bienhoa Prov., *Poilane 199*, fr. July 1919 (P); near Honquan, *Evrard 792*, fr. Apr. 1922 (P); Tha Byh, Tay Minh, *Müller 994*, fl. March 1939 (P); Budap, *Müller 1711*, July 1939 (P).

Sumatra: Sum. E. Coast: Brandar-Batsy For. Res., Simalungan, *Endert 1349*, Jan. 1922 (BZ, L). — Lamp. Distr.: Kutabumi, Tulangbawang, *Gusdorf 187*, fr. Feb. 1914 (BZ); Pamangillan, Seputih, *Dirksen 19*, Jan. 1921 (BZ, L). — Banka: Koba, *Teysmann* (BZ); Sungai Liat, *Teysmann* (BZ); Toboali, *Teysmann*, fl. (BZ); *Anta*, fl. 1949 (BZ, L).

Malay Peninsula: *Scortechini*, fl. (CAL, DD, FI, L); *Scortechini 1155*, Aug. 1884 (CAL); *Ridley*, fr. Aug. 1896 (SING). — Kedah: Bukit Pinang, Alor Star, *Ridley 15182*, March 1910 (BM, K, SING); Gunong Jerei, *Meh CF 9041*, fl. (K); Minjau Kedah, *Meh CF 17790*, fl. March 1929 (K); between Alor Star & K. Nerang, *Corner*, July 1936 (SING); Koh Mai For. Res., *Kiah SF 35212*, fl. Apr. 1938 (A, BRI, BZ, SING). — Perak: Goping, Kinta, *Kunstler 4429*, fl. June 1883 (CAL, K); Temengor, *Ridley 14586*, fr. July 1909 (BM, SING); Grik, Upper Perak, *Burkill & Haniff SF 12409*, fr. July 1924 (SING); Sungai Kenering, Upper Perak, *Henderson SF 23889*, fr. June 1930 (BZ, IFI, NY, SING). — Pahang: Pulau Chengei, Pahang Riv., *Ridley 2614*, fl. & fr. July 1891 (BM, CAL, K, SING); Kuala Tahan, *Seimund 918*, fl. Feb. 1921 (SING); between Raub & S. Simpan, *Burkill & Haniff SF 16853*, fl. Nov. 1924 (BRI, BZ, SING); Rotan Tunggal For. Res., Raub, *Kalong CF 23402*, fr. June 1930 (SING); Chegar Perah, *Henderson SF 22589*, fr. Aug. 1930 (A, BZ, IFI, NY, SING); Resthouse, Raub, *Corner*, fr. Feb. 1936 (SING). — Selangor: Kuala Kubu, *Ridley*, fr. June 1896 (SING); *Goodenough*, fr. 1899 (SING). — Langkawi Isls: Kuala Quah, Langkawi, *Haniff & Nur SF 7073*, fr. Nov. 1921 (SING). — Pulau Penang: *Porter (Wallich 945)*, fl. (K); Waterfall (probably Bot. Gard.), *Curtis 228*, fl. Apr. 1884 & May 1885, fr. Apr. 1890 (BM, CAL, K, P, SING); ibidem, *Curtis*, fl. May 1890 (CAL).

Cultivated: Bot. Gard. Bogor: no IV-G-57, fl. Nov. 1889 & Oct. 1896, fr. Feb. 1896 (BZ, CAL, K, L, MEL); *Lauterbach 474*, fr. 1890 (BRSL); *Kuntze 4898*, fl. June 1895 (NY). — Batavia: Weltevreden, *Backer 35307*, fl. Dec. 1903 (BZ, U); ibidem, *Backer 35308*, fl. Dec. 1904 (BZ, U).

Distribution. Siam and Indo-China N to about 17°30′ N. latitude, Sumatra, Malay Peninsula (not in Johore and Singapore), and Banka.

Ecology. In open forests, savannahs, or belukar; in Malaysia at low altitudes, in Indo-China up to 1500 m.

Vernacular names. Siam: *Inai teo, Masarn, Ma tone* (Sriracha);

Plaw (Sui, Surin); *San doi de* (Ta Uten); *San, Ta nok kod* (Loi); *Ton mesan* (Kaw Chang). Indo-China: *Cay so, Cay xa trop, So, So anh trai* (Annamite); *Phlou, Phlou thom* (Cambodia); *May san* (Laotien); *Blao, Xo pho* (Moi). Sumatra: *Pisang maru, P. mobai* (Sum. E. Coast); *Kaju simpur ajer berak bulung, Ranggang waka, Simpur minjak* (Lamp. Distr.). Banka: *Simpur darut, S. laki.*

Uses. The tree is sometimes planted as an ornamental; the wood is suitable for beams and planks and may be used in furniture-making; the fruit is eaten in jellies.

Note. In general appearance of the leaf the species strongly resembles *D. turbinata*, though in the latter species the leaves are usually more obovate. In flowering state it is easily distinguished from *D. turbinata* by the solitary flowers. As to geographical distribution the species practically exclude each other.

47. Dillenia indica L. 1753

Syalita *Rheede, Hort. Mal. 3, 1683, p. 39—42, t. 38—9; Adans., Fam. d. Pl. 2, 1763, p. 364.

Arbor indica flore maximo, cui multae innascuntur siliquae Ray, Hist. Pl. 2, 1688, p. 1707.

Malus rosea Malabarica Syalita dicta Pluken., Mantissa, 1700, p. 124.

Dillenia Linn., Hort. Cliff., 1737, p. 221; Linn., Crit. Bot., 1737, p. 80.

Dillenia indica L., Sp. Pl., 1753, p. 535; Burm.f., Fl. Ind., 1768, p. 124; **Hill, Dec. Cur. Eleg. Trees, 1773, p. 5, t. 3; *Baill., Adansonia 7, 1866—7, p. 93; Miq., Ann. Mus. Bot. Lugd. Bat. 4, 1868, p. 79; Hook.f. & Thoms., Fl. Br. Ind. 1, 1872, p. 36; Brand., For. Fl. NW. & C. Ind., 1874, p. 1; Kurz, J. As. Soc. Beng. 43, II, 1874, p. 46; Kurz, For. Fl. Br. Burma I, 1877, p. 19; King, J. As. Soc. Beng. 58, II, 1889, p. 366; Watt, Dict. Econ. Prod. Ind. 3, 1890, p. 113; Trim., Handb. Fl. Ceyl. 1, 1893, p. 12; Koord. & Val., Bijdr. 1 Booms. Java, 1894, p. 161; Gamble, List Darjeeling Distr. Beng., 1896, p. 1; Ridl., J. Str. Br. R. A. S. 33, 1900, p. 38; Brand., Ind. Forester 26, 1900, p. 429; Kanjilal, For. Fl. School Circle, 1901, p. 13; Cooke, Fl. Pres. Bomb. 1, 1901, p. 6; Gamble, Man. Ind. Timb. 2nd ed., 1902, p. 4; Prain, Beng. Pl., 1902, p. 195; Duthie, Fl. Upp. Gang. Pl., 1903, p. 21; Brand., Ind. Trees, 1904, p. 3; Moll & Jansson., Mikrogr. Holz. Java Baumarten 1, 1906, p. 71; Fin. & Gagnep., Bull. Soc. Bot. Fr. Mém. 4, 1906, p. 9; Fin. & Gagnep., Fl. Gén. Ind.-Ch. 1, 1907, p. 21; *Talbot, For. Fl. Bomb. Pres. & Sind 1, 1909, p. 10, f. 7; Back., Schoolfl. Java, 1911, p. 10; Kanjilal, For. Fl. Sawilik & Jaunsar For. Div., 1911, p. 32; Koord., Exk. Fl. Java 2, 1912, p. 601; *Koord. & Val., Atl. Baumart. Java 1, 1913, f. 2; Gamble, Fl. Pres. Madras 1, 1915, p. 7; Kirtikar & Basu, Ind. Medic. Pl., 1918, p. 38; Haines, Bot. Bihar & Orissa 2, 1921, p. 6; Merr., Bibl. En. Born. Pl., 1921, p. 383; **Troup, Sylviculture Ind. Trees 1, 1921, p. 6; *Wester, Philip. Agric. Rev. 14, 1921, p. 277, pl. 27a (photo of fruit); Ridl., Fl. Mal. Pen. 1, 1922, p. 10; Craib, Fl. Siam. En. 1, 1925, p. 22; *Gilg & Werderm. in Engl. & Prantl, Nat. Pfl. Fam. 2nd ed., 21, 1925, p. 11; Cowan & Cowan, Trees N. Beng., 1929, p. 8; Pears. & Brown, Comm. Timb. India 1, 1932, p. 3; Kanjilal, Kanjilal, & Das, Fl. Assam 1, 1934, p. 10; Burk., Dict. Econ. Prod. Mal. Pen. 1, 1935, p. 809; **Blatter & Millard, J. Bomb. Nat. Hist. Soc. 38, 1936, p. 415, pl. 29, 31, & 32 & Some Beautif. Ind. Trees, 1937, p. 45 & 3 pl.; Gagnep., Suppl. Fl. Gén. Ind.-Ch. 1, 1938, p. 21; *Corn., Wayside Trees Malaya, 1940, p. 204, pl. 52; Back., Bekn. Fl. Java (em. ed.) 4, 1942, fam. 80, p. 4; *Watanabe, Ill. Comm. Med. Pl. South. Regions, 1942, p. 244; Heyne, Nutt. Pl. Indon., 1950, p. 1072; Quisumb., Medic. Pl. Philip., 1951, p. 612; Hoogl., Fl. Mal. I, 4, 1951, p. 171.

Dillenia speciosa Thunb., Trans. Linn. Soc. 1, 1791, p. 200; **Sm., Exot. Bot. 1, 1804, p. 3, t. 2, 3; Roxb., Fl. Ind. ed. Carey 2, 1832, p. 650; Wight & Arn., Prod. Fl. Pen. Ind. Or. 1, 1834, p. 5; *Wight, Ic. Pl. Ind. Or. 3, 1844—5, t. 823; Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 69; **Hook.f., Bot. Mag. 83, 1857, t. 5016; Miq., Fl. Ind. Bat. 1, 2, 1859, p. 11; Dalz. & Gibs., Bomb. Fl., 1861, p. 2; Drury, Handb. Ind.

Fl. 1, 1864, p. 10; *Bedd., Fl. Sylv. 1, 1869, t. 103; **Réveil c.s., Règne Vég. &c., Fl. Médic. &c., Atl. 1, 1870, pl. 48; **Hérincq c.s., Traité Bot. Gén., Atl. 2, 1870, pl. 37; Laness., Pl. Util. Col. Fr., 1886, pp. 188, 282, 583.

Dilema Griff., Notul. 4, 1854, p. 705.

Dillenia elongata Miq., Fl. Ind. Bat. 1, 2, 1859, p. 12.

Dillenia indica f. elongata (Miq.) Miq., Ann. Mus. Bot. Lugd. Bat. 4, 1868, p. 79.

Dillenia pentagyna Auct. non Roxb.; Laness., Pl. Util. Col. Fr., 1886, p. 281.

Type specimens: *Dillenia indica:* Rheede, l. c., t. 38—39. — *Dillenia speciosa:* idem, cf. below under Notes. — *Dillenia elongata:* Teysmann 453 HB, Lubu Alung, Sum. W. Coast; holotype in U, isotypes in BZ, CAL, L.

Evergreen trees, up to 30 m high, 120 cm thick, with usually rather crooked trunk, without or with small buttresses, usually shallowly grooved and with many knots; crown irregular, attached up to ca 15 m, usually lower, rather lax with thick, crooked, richly branched branches. Bark smooth, rich orange brown to dark orange, moderately thick (up to ca 7 mm), peeling off in small, thin, hard scales. Sapwood white; heartwood pinkish white or light brown or dark red. Branches sympodial, younger ones ca 5 mm thick, appressedly silky hairy, most densely so just above axil of leaves, under insertion of leaves with suberect hairs, glabrescent. Leaf-scars clasping about $^1/_2$ of branch, subfalcate with ca 15 leaf-traces in upper half. *Leaves* oblong, (8—)15—30(—40) × (4—)6—12(—15) cm, with (20—)30—40(—70) nerves on either side, in young trees and on saplings up to 70 × 18 cm; acute or obtuse, sometimes slightly acuminate at apex, rounded to acute at base, decurrent; margin slightly to distinctly dentate with nerves ending in apex of teeth; bright green, shining, glabrous on intervenium and nerves, sparsely hirsute on midrib above, less shining, glabrous to sparsely strigose on intervenium, sparsely to rather densely strigose on nerves and midrib beneath. Petiole $2^1/_2$—$7^1/_2$ (—15) cm, glabrous above, more or less densely silky strigose beneath. *Flowers* solitary, terminal, 15—20 cm across. Pedicel 4—8 cm, 4—6 mm thick, thickened to ca 8 mm at apex, appressedly silky hairy, most densely so immediately below flower, sometimes with single lanceolate bracteole, up to 6 × 2 mm, glabrous above, strigose beneath. Sepals 5, in open flower forming cup-shaped calyx, yellowish green, oval, 2 outermost ones 40—50 × 30—40 mm, 3 innermost ones 50—60 × 40—50 mm, up to 10 mm thick at base, glabrous on both sides, not ciliate at margin. Petals 5, white with green veins, obovate, 70—90 × 50—65 mm, rounded at apex, narrowed towards base. Stamens in 2 distinct groups, those of outer group (ca 550) slightly curved in bud, 13—15 mm long, those of inner group (ca 25) with apical part reflexed outward in bud, 20—22 mm long; filament white, of stamens of outer group 5—7 mm long, flattened, ca 0.5 mm broad, of those of inner group 6—10 mm long, rather thick, ca 0.7—0.9 mm broad, 0.4 mm thick; anther ca 0.7—0.9 mm broad, emarginate at apex; thecae linear, opening with pore near apex on outer side. Carpels 14—20, yellowish green, arranged around broad conical receptacle, lanceolate ca 14 × 3 mm, glabrous, each with 40—80 ovules in 2 double rows; styles spreading, white, at base yellowish, linear-lanceolate, ca 25 mm long, flat, up to $3^1/_2$ mm broad, channelled above, acute at apex. *Pseudocarps* indehiscent, yellowish green, about globular, ca 8—10 cm diam. including enclosing sepals, 2 outermost ones of which are up to 12 × 9 cm, 3 innermost ones up to 15 × 12 cm, all up to $2^1/_2$ cm thick at base; carpels ca 35 × 15 mm, each with 5 or more seeds embedded in glutinous pulp. Seeds reniform, ca 4 × 6 mm, black, finely echinate, mainly along outer margin, with up to 0.6 mm long spines, exarillate.

India: *F. v. Mueller*, fl. (CAL); Himalaya, *Rich 125* (K); "Pen. Ind. Or.", *Rottler* (K); *Wallich 943A*, fl. (CGE, G); Plains of India, *Royle*, fl. (K); *Wight 21*, 1832 (CGE, G, GL, K); N. Divis., *Kistnasawmy 1856*, fr. July 1884 (MEL); *Cowan*, fl. June 1923 (E); Murkongselleh US 7 P. Pathak, *Off. Supervisor*, fl. July 1936 (DD). — South. Himalaya Region: Naokote, *Wallich 943B*, May 1821 (K); Nepal, *Wallich 943*, fl. 1829 (CGE, K); Sikkim Terai, *Hooker*, fr. (K); Sikkim, *Hooker* (GH, P); Sikkim Siooke, *Gamble 1070*, Feb. 1873 (DD, K); Duphla Hills, *Lister*, 1874 (CAL); Duphla Hills, Dorpani & Hamatti, *Lister*, Feb. 1875 (CAL). — United Provs: Saharunpur, *Jameson* (E). — Behar & Orissa: Balidiha, Mayurbhanj, fr. Sept. 1940 (DD). — Deccan Peninsula: Fort St George, *Bulkley*, 1703 (OX); Malabar (L); ibidem, fl. (M); Coromandel, Macé, fl. (P); Coromandel, *König*, fl. (BM); Madras, *Bourne 2220*, June 1900 (K); ibidem, *Bourne 2451*, fl. Aug. 1901 (K). — Bengal: Gathord, *Bulkley*, Oct. 1704 (OX); *Roxburgh*, fl. 1796 (E, G); *Roxburgh*, fl. 1797 (LINN); *Roxburgh*, fl.. (BM); Calcutta, *Wallich*, fl. (G); *Wallich 943*, fl. (CAL, CGE, K); E. Bengal, *Griffith 55A*, fl. (CAL, GH, P); Dewangung (W. Mymensing), *Clarke 4847*, fl. July 1867 (BM); Chittagong Hill Tracts, *Teague 3*, Apr. 1914 (DD); Agartala, Tipperah (Hill), *Debbarman 345*, Dec. 1914 (CAL); Kelatuli For., Cox's Bayas, *Sinclair 3199*, Aug. 1943 (E). — Assam: Goalpara, *Hamilton 1256 (= Wallich 943E)*, fl. July 1808 (CGE, E, K); *Jenkins* (CAL); *Jenkins 348*, Upper Assam, fl. (K, NY); Plains of Assam, *Masters 56* (MEL); banks of the Brahma, *Masters 1035*, fr. (CAL); *Simons* (CAL); Outer Khasia Hills, below Cheerung, *Schlich 15001* (DD); Cachar, *Hooker & Thomson* (K); Silhet, *Hooker & Thomson* (K); ibidem, *Hooker & Thomson*, Aug. 1850 (CGE); ibidem, *Hooker & Thomson*, Nov. 1850 (BM, C, CAL, CGE, G, GH, L, P); Telain, *Hooker & Thomson*, Nov. 1850 (P); Digboi, Upper Assam, *Barnard DD 15*, fl. July 1935 (BM); Pengaree, Upper Assam, *Barnard DP 16*, fl. July 1935 (BM); Darrang Div., *For. Off. 1*, fl. June 1937 (DD); Kamrup Div., *For. Off.*, fl. & fr. 1937 (DD); Siksager Div., *For. Off.*, fl. 1937 (DD).

Ceylon: *Herb. Burman* (L); *Herb. Houttuyn* (L); *Thwaites CP 2961*, fl. (DD, K); *Walker*, fl. (G).

Burma: Maulmein, *Falconer 271*, fl. Feb. (CAL); Mergui, *Griffith*, fl. (K); Pegu, Yomah hills, *Kurz 1805*, fr. (CAL); *Toppin 3131* (CAL); Yahudan, Tenasserim, *Meebold 14737*, fr. March 1911 (CAL); Tavoy Distr., Kaleinaung Res., *Parker 2209*, fr. Nov. 1924 (A, DD); Kokkine, Rangoon, *Parkinson 14459*, fl. June 1932 (DD).

China: Yunnan: Szemao, *Henry 12746*, fr. (K, NY); Fo Hai, *Wang 74979*, fr. July 1936 (A); Sheau-meng-yeang, Che-li-Hsien, *Wang 75586*, fl. 1936 (A); ibidem, *Wang 75788*, fr. Aug. 1936 (A); Maan-bang, Dahl-meng-lung, Che-li-Hsien, *Wang 76358*, fl. Aug. 1936 (A); Che-li-Hsien, *Wang 78021*, fr. Aug. 1936 (A); Maan-kung-han, Dah-meng-lung, Che-li-Hsien, *Wang 78604*, Sept. 1936 (A); Maan-tsang, Sheau-meng-yeang, Luh-shuen-Hsien, *Wang 81061*, fr. Nov. 1936 (A).

Siam: Krungtep, Bangkok, *Kerr 4337*, fl. July 1920 (BM, K); ibidem, *Marcan 299*, fl. July 1920 (K) (both probably planted). — Rachaburi: Neeckey, near Wangka, *Kostermans 751*, May 1946 (L); S of Ka Tha Lai in Pan Paung Riv. Valley, *Kostermans 846*, fl. June 1946 (L). — Surat: Ban Kamp Kep, *Kerr 13348*, fl. Aug. 1927 (BM).

Indo-China: Mekong, Tak Sai, *Thorell* (P). — Tonkin: Tchontiao, near Mnt Bavi, *Balansa 3380*, fl. July 1886 (P); Tu Phap, near Mnt Bavi, *Balansa 3381*, fl. Aug. 1886 (K, P); between Phu nho quan & Yen Doe, *Chevalier 29174*, Nov. 1913 (P); Le Pau Nhau near Lai Chan, *Poilane 26961*, fr. Dec. 1937 (P); N. of Tonkin, *Poilane* (P). — Laos: Ban-bo, *Spire 264*, fl. (P); Cam Keut Prov., *Spire 317* (P). — Annam: Co Ba For. Res., Nghé-An (Vinh) Prov., *Fleury 30193*, fr. May 1914 (P); Loc han, Chanh hoa Prov., *Poilane 1733*, fl. Aug. 1920 (P); Tourane & Vicinity, *Clemens 3407*, June 1927 (A, NY, P, UC); foot of the Bu Khang, Vinh Prov., *Poilane 16643*, fl. Aug. 1929 (P). — Cambodia: Krwanh Mts, *Pierre 3381*, fl. March 1870 (P).

Sumatra: (GH); *Korthals* (L, MEL); *Forbes*, 1881—2 (SING). — Atjeh: Gulo, Alas Lands, *Pringgo Atmodjo 451*, fr. June 1904 (BZ, L); Gajo Lucus near Gunung Gumpang, *NIFS bb 22474*, Feb. 1937 (BZ, L). — Tapanuli: Sibolga, *Batten Pooll*, fr. Aug. 1939 (SING). — Sum. W. Coast: Duku, *Korthals* (L); Lubu Alung, *Teysmann 453 HB* (BZ, CAL, L, U). — Sum. E. Coast: Benkalis, Lebong, near Ulung

Tandjung Aer, Katanang, *NIFS bb 2948*, fr. March 1922 (BZ). — Indragiri: Kuanten Riv. near Belukan, *Koorders 10290 β*, Feb. 1891 (BZ). — Palembang: Rawas, *Grashoff 1150* (BZ, L). — Lamp. Distr.: Kottadjawa, *Forbes 1303*, July 1880 (BM, CAL, FI, GH, L, P); Kota Agung, *NIFS bb 13611*, fr. Feb. 1929 (BZ).

Malay Peninsula: *Scortechini 403*, fr. (CAL, SING); *Scortechini*, fl. June 1884 (K). — Perak: Ulu Temengor, *Ridley 14587*, fl. & fr. July 1909 (BM, K, SING); Batu Tegoh, Taiping, *Henderson SF 10309*, fr. Aug. 1922 (SING); Ulu Kenderong, Upper Perak, *Hamid CF 11050*, fr. March 1926 (SING). — Kelantan: Chaning, *Ridley*, fr. Feb. 1914 (K, SING); Sungai Ketil near Gua Musang, *Henderson SF 22654*, fr. Aug. 1929 (BRI, IFI, SING). — Trengganu: Ulu Brang, *Moysey & Kiah SF 33871*, fr. July 1937 (SING). — Pahang: Pulau Tawar, *Ridley 2673*, fl. 1891 (CAL, SING); Sungai Sar, Ulu Tembeling, *Henderson SF 22064*, fl. & fr. July 1929 (A, BZ, SING); Sungai Serau, *Oswon CF 27051*, fr. Oct. 1931 (SING); base Bukit Batu Papan, Sungai Lebir, *Henderson SF 29560*, fr. July 1935 (BZ, K, SING). — Selangor: Batu Tiga, *Wray 2154*, fr. June 1888 (CAL, SING). — Malacca: Bukit Panchor, *Goodenough 1263*, fl. (BM, SING); ibidem, *Derry 1083*, fr. Sept. 1892 (MEL, SING). — Pulau Penang: *Maingay 7/2*, fl. & fr. (BM, CAL, G, K, L); Dolo Kramat, *Curtis*, fl. July 1890 (SING). — Singapore: *Ridley*, fr. Nov. 1892 (SING); Bukit Panping, *Ridley 3702*, fr. 1892 (CAL, SING).

Java: (BZ, L, U); *Lahaie 2214*, fr. 1794—6 (P); *Blume*, fr. (CAL, L, NY); *Korthals*, fl. & fr. (L); Tempuran, near Batu nante, *Korthals* (L); *Junghuhn* (L); *de Vriese* (L). — W. Java: Palabuanratu, *Koorders 1622 β*, May 1890 (BZ); ibidem, *Koorders 1623 β* (BZ, L); Buitenzorg, *Boerlage*, Nov. 1896 (BZ); Tjitarik near Tjisalak (Parungkuda), *Bakhuizen v. d. Brink 5065* (= *Bakhuizen v. d. Brink Jr 659*), Dec. 1920 (BZ, L, U); Buitenzorg, *Bakhuizen v. d. Brink Jr 2042*, fl. Dec. 1922 (BZ, U). — C. Java: Kedungdjati, *Koorders 1627 β*, Aug. 1888 (BZ); ibidem, *Koorders 1625 β*, Nov. 1888 (BZ, K, L, P, WAG); ibidem, *Koorders 1626 β*, Dec. 1888 (BZ, L); Brebes, Tegal, *Koorders 1621 β*, Sept. 1891 (BZ, L); Kedungdjati, *Koorders 1628 β*, Apr. 1892 (BZ, K, L, P); Subah, Pekalongan, *Koorders 11426 β*, fr. Apr. 1892 (BZ); ibidem, *Koorders 14293 β*, June 1893 (BZ); ibidem, *Koorders 14826 β*, fl. Nov. 1893 (BZ, WAG); Kedungdjati, *Koorders 25517 β*, fl. & fr. Nov. 1896 (BZ, WAG); Subah, Pekalongan, *Koorders 27350 β*, fr. Apr. 1897 (BZ); ibidem, *Koorders 36915 β*, fr. May 1899 (BZ, L); ibidem, *de Monchy*, fr. (BZ); Darupono between Bodja & Kendal, *Beumée 3871*, March 1919 (BZ, WAG); Subah, Pekalongan, *Wolff v. Wülfing 4245*, June 1919 (BZ). — E. Java: Passinan, Lumadjang Prov., *Zollinger 2672*, fr. Feb. 1845 (BM, BZ, FI, G, P).

Borneo: *Korthals*, fl. (K, L, U, S). — NW. Borneo: Sarawak Riv., *Beccari PB 2828*, fl. Nov. 1886 (FI, K). — S. & SE. Borneo: Bandjermasin, *Korthals*, fr. (L); Tewe Riv., *Korthals*, fl. (L); between Muara Uja & Kundiru Baru, *Winkler 2710*, fl. July 1908 (BRSL, L). — E. & NE. Borneo: B. Ulu Sibuku, *Amdjah 529*, fr. 1893—4 (BZ, L); Gitam Riv., lower Mahakam region, *Witkamp*, fr. (BZ); W. Kutai, near Kikam Batu, *Endert 2347*, Aug. 1925 (BZ, L). — Br. N. Borneo: *Wood 925*, fr. Oct. 1920 (A, US).

Cultivated: Dehra Dun: *Edgeworth 49*, fl. 1844 (K); *Gamble*, fl. (OX); *Gamble 24690*, fl. Aug. 1894 (K); *Bulakidass*, fl. June 1915 (DD); *Gupta*, fl. Sept. 1921 (DD); *Kewalramani 1*, fl. July 1922 (CAL); *Khan*, fl. Aug., fr. Oct. 1930 (DD); *Gupta*, fl. July (IFI); *Sharma 22*, fl. July, fr. Dec. (NY). — Calcutta: *Voigt*, fl. (C); *Wallich 826*, fl. 1815 (C); *Wallich 943*, fl. (K); *Wallich 77*, fl. (P); *Wallich*, fl. (C); *Falconer 78*, fl. & fr. (CAL, GH, K, L, P); *Hooker & Thomson*, July 1845 (P); *Pierre*, fl. 1863 (P); *Kurz* (BZ); fl. & fr. (BZ, C, K, L, M, P); *King*, fl. (CAL). — Penang: Waterfall Gard., *Nur*, fr. July 1918 (SING); *Nur*, fr. Sept. 1918 (SING); Waterfall Gard., *Haniff 53*, fr. Jan. 1928 (UC). — Singapore: Arboretum, *Nur 1545*, March 1918 (SING); Gard. Jungle, *Burkill*, Nov. 1918 (SING); Bot. Gard., *Deshmukh*, fr. July 1920 (SING); ibidem, *Best*, fr. Sept. 1921 (SING); ibidem, *Nur*, July 1924 (SING); ibidem, *Nur*, fr. Sept. 1929 (A, BZ, SING); Water viaduct between Mac Ritchie Reservoir & Pierce Reservoir, *Sinclair*, July 1949 (DD, L). — Sibolangit: *Lörzing 9081*, fr. June 1922 (BZ, L). — Bot. Gard. Bogor: (BZ, FI); *155*, fl. (BZ); no IV-G-11, fr. June 1890 & fl. Jan. 1892 (BZ); no IV-G-14a, fr. June 1890, fl. Nov. 1891, fr. Apr. 1912 (BZ); *van Harreveld*, July 1907 (GRO); no IV-G-54 (BZ); no XI-B-(III)3 (BZ). — Flores: Endeh, *van Heurn*, fr. Apr. 1930 (BZ). — Luzon: Manila, *MacClure BS 16091*, fr. Sept. 1925 (UC). — Brisbane: Bot. Gard., *White 8807*, fl.

(BRI). — Hawaii: Wahiaura Gard., Ouahu, *Degener 12821*, fr. Jan. 1940 (MO, NY). — Panama: Balboa, *Standley 30869*, Nov. 1923—Jan. 1924 (K); Exper. Gard., *Wetmore & Abbe 239*, Jan. 1932 (A); fl. & fr. (C; photograph). — Cuba, Harvard Trop. Gard., Soledad: no 4146, *Jack*, fr. March 1926, veg. June 1928 (A); no 5559, *Jack*, fl. Oct. 1927 & July 1929 (A, NY). — Santo Domingo: Rio Yabón, *Ekman 15666*, July 1930 (S). — Costa Rica: Mayaguez, Agric. Exper. Stat., *Britton & Britton 7451*, Nov. 1923 (NY). — St Thomas: *Conde de Val Flov*, Sept. 1907 (BM); *Neltkropp*, Dec. 1930 (NY; seedlings). — Martinique: *Hahn 1156*, fr. Oct. 1869 (BM, P). — Brasil: near Manos, *Labroy*, fl. July 1906 (P). — Amani, E. Afr. Res. Inst.: *Greenway 1585*, June 1929 (IFI, K). — Goettingen, Bot. Gard.: *Hallier*, Feb. 1892 (L). — Exact locality unknown: Hort. Chel., May 1823 (K); *Salvoza 594*, fl. July 1929 (A).

Locality unknown: several specimens (C, CAL, CGE, DD, E, G, L, MEL, NY, S); Khawak, *Edgeworth*, March 1841 (OX).

Distribution. India, Burma, S. China (Yunnan), Siam, Indo-China, Sumatra, Malay Peninsula, Java, and Borneo. The species is often cultivated and it is therefore difficult to say whether it is indigenous in all the regions mentioned.

Ecology. The species is often found along streaming water (*Saraca* streams sensu Corner and larger rivers). The fruits which are edible are dispersed either by animals, e. g. elephants (cf. Blatter & Millard, l. c.), or by streaming water. In the latter case the fruit as a whole may be deposited on a river edge and the seeds may germinate inside the fruit (cf. figure in Troup, l. c.).

Vernacular names. A very large number of vernacular names has been noted for the species in India and Burma in the literature mentioned above. Unfortunately on the herbarium labels rarely names are noted which makes it difficult to say whether the names all refer to the present species; the total number exceeds 45. The following list is taken from Pearson & Brown, l. c. and may represent the most generally used and reliable ones: *Otengah, Otingah* (Assam); *Panpui* (Garo); *Chalta, Chalata, Hargesa* (Bengal); *Ramphal mechiaphal* (Nepalese); *Mota kermal* (Marathi); *Thabyu* (Burmese); *Uva* (Tamil); *Uva, Pedda kalinga* (Telugu); *Betta-kanagala, Kad-kanagala* (Kanarese, Bombay); some other names are: *Syalita* (Malayalam); *Hondapara, Wampara* (Singhalese, Ceylon). Outside India and Burma the following names have been noted: Siam: *Matat* (Siamese, Bangkok), *Sankwang* (Surat), *San pao* (Lao, Chiengmai). Indo-China: *Cay so* (Annamese), *Co sanh* (Muaong, Annam), *Dok shan* (Laos), *Mak sane* (Laos). Sumatra: *Ampalo* (Idrag.), *Simpur* or *S. ajer* (Atjeh, Sum. E. Coast, Palemb.). Malay Peninsula: *Simpoh* or *S. ajer*. Java: *Simpur ajer* (Malay); *Sempur, S. batu, S. tjai* (Sundanese); *Kosar* (fide Koorders & Valeton, l. c.), *Lampes* (?: *Koorders 14293β*), *Lengsar* (*Koorders 36915β*), *Sapi* (*Koorders 27350β*), *Sempu, Simpol* (Javanese). Borneo: *Kajo kaloh* (Kajan-Dajak, W. Kutai).

Uses. The wood yields a fair plank and rafter and is suitable for interior use and ornamental panelling; in India it is used for making gunstocks and boats. It yields an excellent firewood. The fruit, particularly the thickened calyx, is eaten in curries or jellies, and mixed with sugar used as a cough mixture. It gives a lather with water and is used as soap. Because of its beautiful foliage and flower the species is often planted as an ornamental tree; in glasshouses it seems to be rarely in flower (Baillon 1866—7).

Notes: 1. In the Species Plantarum ed. 1 (1753) Linnaeus cited under *Dillenia indica* only *Dillenia* Linn., Hort. Cliff. and *Syalita* Rheede, Hort. Mal.. The specimen in Clifford's garden lived only a few weeks and can hardly be considered the type of the species, the less so as no material seems to have been preserved. I therefore consider as the type the figure in Rheede's Hortus Malabaricus, on which Linnaeus' description is practically wholly based.

2. In the Mantissa Plantarum II, 1771, p. 405 Linnaeus makes a note that *Sangius* Rumph. belongs to the same genus; in the Species Plantarum ed. 2, 1762, p. 754 he reduced *Sangius* Rumph. to *D. indica.* Thunberg (1791) bases on *Sangius* Rumph. the binomial *Dillenia serrata* Thunb. and on *Syalita* Rheede the binomial *Dillenia speciosa* Thunb.; the latter name for having the same type as *Dillenia indica* L. is superfluous.

3. *Dillenia indica var. aurea* (Sm.) O. K. has to be excluded (cf. under *Dillenia aurea* Sm.) as well as some of the figures published under the name *Dillenia speciosa* Thunb., representing *Hibbertia scandens* (Willd.) Dryand. (cf. p. 136).

48. Dillenia pulchella (Jack 1822) Gilg 1893

Wormia pulchella Jack, Mal. Misc. 2, 7, 1822, p. 70; Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 68; Miq., Fl. Ind. Bat. 1, 2, 1859, p. 11; Hook.f. & Thoms., Fl. Br. Ind. 1, 1872, p. 36; Villar, Nov. App., 1880, p. 347; King, J. As. Soc. Beng. 58, II, 1889, p. 365; Ridl., J. Str. Br. R. A. S. 33, 1900, p. 37; Gage & Burk., J. Str. Br. R. A. S. 73, 1916, p. 243; Ridl., Fl. Mal. Pen. 1, 1922, p. 9; Burk., Dict. Econ. Prod. Mal. Pen., 1935, p. 2265; Corn., Wayside Trees Malaya, 1940, p. 206.

Dillenia micrantha Martelli in Becc., Malesia 3, 1886, p. 156; Merr., Bibl. En. Born. Pl., 1921, p. 383.

Dillenia parvifolia Martelli in Becc., Malesia 3, 1886, p. 158; Merr., Bibl. En. Born. Pl., 1921, p. 383.

Dillenia pulchella (Jack) Gilg in Engl. & Prantl, Nat. Pfl. Fam. 3, 6, 1893, p. 123; Merr., Bibl. En. Born. Pl., 1921, p. 383; Heyne, Nutt. Pl. Indon., 1950, p. 1072; Hoogl., Fl. Mal. I, 4, 1951, p. 171.

Type specimen: *Wormia pulchella:* Jack, Natal, Sumatra, probably lost; Ridley 3965, Singapore, 15 Oct. 1892; neoholotype in L, isotypes in BM, CAL, MEL, SING. — *Dillenia micrantha:* Beccari PB 514, Sarawak, Banting, Batang Lupar Prov., Sept. 1865; holotype in FI. — *Dillenia parvifolia:* Beccari PB 3177, Sarawak; lectoholotype in FI, isotype in K.

Fig. 10 e—h, p. 95.

Evergreen trees, up to 40 m high, 90 cm thick, with up to 25 m bole, with large and heavy crown, without buttresses. Bark reddish, with clear or red sap. Heartwood red. Branches not typically sympodial, younger ones ca 1 mm thick, glabrous. Leaf-scars clasping about $^1/_2$ of branch, subfalcate with ca 7 leaf-traces about middle. *Leaves* oval to ovate, (4—)5—10(—15) × (2$^1/_2$—)3$^1/_2$—5$^1/_2$(—9) cm, with (4—)6—7(—8) nerves on either side; rounded, sometimes slightly emarginate, to obtuse at apex, acute at base, decurrent; margin entire, nerves curving upward, ending about 1 mm from margin; bright green, shining, glabrous above, dull, glabrous with glabrous domatia in axil of nerves beneath. Petiole 1—1$^1/_2$ cm, glabrous. *Flowers* axillary, solitary or 2, rarely 3 serially placed, often 2—4 mm above axil and serial flowers 2—4 mm above each other, less often 3—6 flowers on apical part of leaf-less branch with distinct leaf-scars. *Flowers* ca $3^{1}/_{2}$ cm across. Pedicel $2^{1}/_{2}$—$7^{1}/_{2}$ cm, 1 mm thick, thickened to $2^{1}/_{2}$—3 mm at apex, glabrous to sparsely hirsute, without or with 1—2 small bracteoles, ca 1 × 1 mm. Sepals 5, ovate to oval, outermost one ca $8^{1}/_{2}$ × 7 mm, 4 innermost ones 12—16 × 8—11 mm, glabrous inside, glabrous to sparsely hirsute outside, sparsely shortly ciliate at margin. Petals 5, yellow, oblong, ca 20 × 9 mm, with rounded apex and base. Stamens in 2 distinct groups, those of outer group (ca 110) slightly curved in bud, 4—$4^{1}/_{2}$ mm long, those of inner group (ca 10) with apical part reflexed outward in bud, 10—11 mm long, thicker than those of outer group; filament in stamens of outer group $1^{1}/_{2}$—3 mm long, 0.2—0.4 mm broad, in those of inner group 5—7 mm long, 0.4—1.0 mm broad; anther of stamens of outer group ca 0.5, of those of inner group ca 1.0 mm broad, obtuse to slightly emarginate at apex; thecae linear, opening with lateral longitudinal slits. Carpels 4—6, usually 5, arranged around narrow conical receptacle, oblong, ca 4—$4^{1}/_{2}$ × 1—$1^{1}/_{2}$ mm, glabrous, each with 7—10 ovules; styles spreading, pink, linear, flattened, $5^{1}/_{2}$—$6^{1}/_{2}$ mm long, at base ca 1.0, near apex ca 0.2 mm broad, acute at apex. *Pseudocarps* dehiscent, sepals in fruit enlarged to ca 20 × 10 mm; carpels ca 15 × 12 mm, each with 1—2 seeds. Seeds obovoid, ca 3 × 2 mm, enclosed by red, membranous aril.

Sumatra: Tapanuli: near Barus Kobun (M. Tapus), *NIFS bb 31018*, Dec. 1939 (BZ, L). — Sum. E. Coast: near the Aek Kanopan, Lundut Concess., Kuala, *Bartlett 6903*, fr. March 1927 (MICH, NY, US); Bengkalis, near Pulau Mendal Kelumang, *NIFS bb 12477*, May 1928 (BZ); Selat Pandjang Panglong (Pulau Tebing Tinggi), *NIFS bb 17701*, Oct. 1933 (A, BZ, L). — Indragiri: near Belimbing, *NIFS bb 28567*, July 1939 (BZ, L); ibidem, *NIFS bb 28710*, Aug. 1939 (BZ, L, SING). — Djambi: near Betaro, *NIFS bb 12860*, Nov. 1928 (BZ). — Palembang: Banjuasin & Kubu Region, *Endert 347*, 1918 (BZ, L); Banjuasin, near Kajunglintjir, *NIFS T 1062*, Apr. 1924 (BZ); Banjuasin, Sebubut, *NIFS T 1209*, fr. Apr. 1925 (BZ); Sehanak Riv., *NIFS bb 13605*, fl. & fr. Apr. 1929 (BZ). — Banka: Djebus, *Teysmann* (BZ); *Teysmann* (BZ); S. Banka, Bihang, *NIFS bb 15092*, March 1931 (BZ). — Riouw-Lingga Archip.: Lingga, near Labuh (Pulau Singkep), *NIFS bb 17173*, Nov. 1932 (A, BZ); Karimun, Simpang Kiri, *NIFS bb 17407*, May 1933 (BZ, L); Karimun, Paja Selegeh, Tandjong Batu, *NIFS bb 17404*, May 1933 (BZ, L).

Malay Peninsula: *Ridley*, fr. (UC). — Perak: Larut, *Kunstler 2472*, fl. Oct. 1881 (CAL, E); *Kunstler 10573*, fr. July 1886 (BM, CAL, DD, FI, K); Taiping, *Curtis = 1379*, fr. Oct. 1895 (BM, SING, UC); Sungai Krian Est., *Spare SF 36206*, fl. Feb. 1939 (A, BZ, SING). — Dindings: Pangkor, Lumut, *Curtis 1379*, fr. Jan. 1888 (K, SING). — Pahang: Kuala Pahang, *Ridley*, fr. (MEL); ibidem, *Ridley 1499*, fr. May 1890 (CAL, SING); Belingoo, Temerloh, *Lela CF 2677*, fr. (SING). — Malacca: *Griffith*, fr. (CAL, K); *Griffith 54*, fr. 1845 (GH, K, P); *Anderson*, 1863 (P); *Maingay 1440 (Kew Distr. 5)*, fl. Dec. 1865—6 (CAL, K); Selandar, *Alvins 656*, fr. Jan. 1885 (SING); ibidem, *Alvins*, fr. March 1886 (SING); Bukit Bruang, *Derry 446*, fr. Apr. 1890 (MEL, SING); Ayer Panas, *Derry 505*, fr. Apr. 1890 (K, SING); Bukit Bruang, *Ridley*, fr. 1892 (CAL). — Johore: Pinyerong, *Cantley*, fr. Feb. 1882 (SING); Penkalan Raja, Pontian, *Ngadiman SF 26640*, July 1939 (SING). — Singapore: fl. (A, SING); *Ridley*, fr. (K); Dalvery Road, *Ridley 4713*, fr. (CAL, DD, K, L, SING); Bukit Timah, *Ridley*, fl. Feb. 1890 (SING); Chan Chu Kang, *Ridley 3965*, fr. Oct. 1892 (BM, CAL, L, MEL, SING); Jurong, *Niat*, fl. 1894 (SING); Bukit Timah, *Ridley 5849*, fl. 1894 (MEL, SING, UC); Grange Road, *Ridley*, fr. 1905 (MO); Cluny Road, *Ridley*, fl. March 1906 (MO); Dalvery Road, *Ridley*, fr. May 1906 (BZ); Jurong, *Corner SF 26041*, fl. Nov. 1932 (BZ, K, SING).

Borneo: Setapok For. Res., *Caroll 7176*, fl. Jan. 1922 (SING). — NW. Borneo: Banting, Batang Lupar Prov., *Beccari PB 514*, fl. Sept. 1865 (FI); near Kuching, *Beccari PB 3177*, fl. (FI); ibidem, *Beccari PB 4065*, 1866 (FI); *Beccari*, fr. (P); near Kuching, *Haviland 1975*, fr. Dec. 1892 (K, L); ibidem, *Haviland 2213*, fl. Feb. 1893

(K, SING); ibidem, *Haviland 2214*, fl. Feb. 1893 (BM, K, L, SING); Redjang, Libu, *Haviland = 2214*, fl. March 1893 (GH); ibidem, *Haviland = 2214*, fr. Apr. 1893 (BM, CGE, K, L, SING, UC); *Nat. Coll. 2406*, fr. Feb.—June 1914 (A). — W. Borneo: Sintang, *Teysmann 8145 HB*, fr. (BZ); near Kubu, *NIFS bb 6334*, March 1924 (BZ); Mempawah, near Amdjongan, *NIFS bb 14244*, May 1930 (BZ); Sintang, Sekawas (Kapuas Riv.), *Main 1782*, fl. Sept. 1949 (BZ, L). — Br. N. Borneo: Mengalong, *Melegrito BNB 2504*, fl. Jan. 1932 (BZ, IFI, K); ibidem, *Melegrito BNB 2509*, fl. Feb. 1932 (A, BZ, K); Pasir Tinggi, Weston, *Suleiman BNB 2182*, fr. March 1932 (A, BZ, IFI, K).

Cultivated: Kuala Lumpur: Public Gard., *CF 939*, fl. Jan. 1917 (SING). — Singapore: Arboretum, Gard. no 1891, *Nur*, March 1918 (SING); Lawn J, *Nur 175*, Aug. 1918 (SING); Arboretum, *Nur*, June 1924 (SING).

Distribution. Sumatra, Malay Peninsula, Riouw-Lingga Archipelago, Banka, and Borneo; in Borneo until now not found in the eastern part.

Ecology. In primary and old secondary forests at low altitudes, on wet, often peaty soil.

Vernacular names. Sumatra: *Djaha keling* (Palemb.), *Dungun* (Sum. E. Coast), *Simar pimasa* (Tapan.), *Simpur paya* (Sum. E. Coast). Malay Peninsula: *Simpoh ayer* (= water s.), *S. paya* (= marsh s.), *S. paya hitam* (= black marsh s.). Riouw-Archipelago: *Perepat darat*. Borneo: *Debah lulus, Ilas* (Dajak); *Simpur bukit, S. laki, S. rimba* (Mal.; Brunei and Br. N. Borneo).

Uses. The wood, which is hard and heavy, is of good quality and sometimes used in house-building. The species may be suitable as an ornamental tree.

49. Dillenia parkinsonii Hoogl. spec. nov.

Type specimen: Anonymus 863, Nanleikchaung For., Upper Chindwin Divis., Burma, 24 May 1934; holotype in K.

Descriptio typi: Rami novelli breviter sericei; cicatrices ramos $^3/_4$ amplectentes. Folia obovato-oblonga, 23—27 × $6^1/_2$—$10^1/_2$ cm, 40—50-nervata, apice acuta, paulo acuminata, basi acuta decurrente, margine dentata. Petiolus 2—3 cm. Inflorescentiae probabiliter lateraliter dispositae ad ramos defoliatos, biflores. Flores diam. ca 8 cm; pedicellus 20—65 mm, in floribus bracteolatus bracteolis 3 subverticillatis, caducis, 20—32 mm longis, in fructu 20 mm longus ebracteolatus. Sepala 5, 2 exteriora ovata, ca 20 × 14 mm, 3 interiora obovata, ca 23 × 12 mm, intus glabra, extus sparsim strigoso-hirsuta, margine ciliata. Petala 5, obovata, ca 40 × 30 mm. Stamina ca 230, conformia, 11—14 mm longa; filamentum 7—9 mm longum. Carpella 5—7, glabra, oblonga, ca 6 × 2 mm, 14-ovulata, stylis paulo divergentibus. Fructus indehiscens, subglobularis, ca 2 cm diam.; carpella ca 10 × 6 mm, usque ad 5-seminata; semina exarillata.

Fig. 11, p. 116.

Shrub or tree?, probably deciduous. Branches not typically sympodial, younger ones ca 2 mm thick, slightly to densely sericeous, glabrescent. Leaf-scars clasping about $^3/_4$ of branch, narrowly subfalcate with ca 21 leaf-traces about middle. *Leaves* obovate-oblong, 20—27 × $6^1/_2$—$10^1/_2$ cm, with 38—50 nerves on either side; acute, slightly acuminate at apex, acute at base, decurrent; margin distinctly dentate, nerves slightly curving upward, ending in apex of teeth; scabrid, shortly hirsute above, slightly scabrid, sparsely shortly hirsute on intervenium, strigose along nerves and midrib beneath. Petiole 2—3 cm, sparsely hirsute above, rather

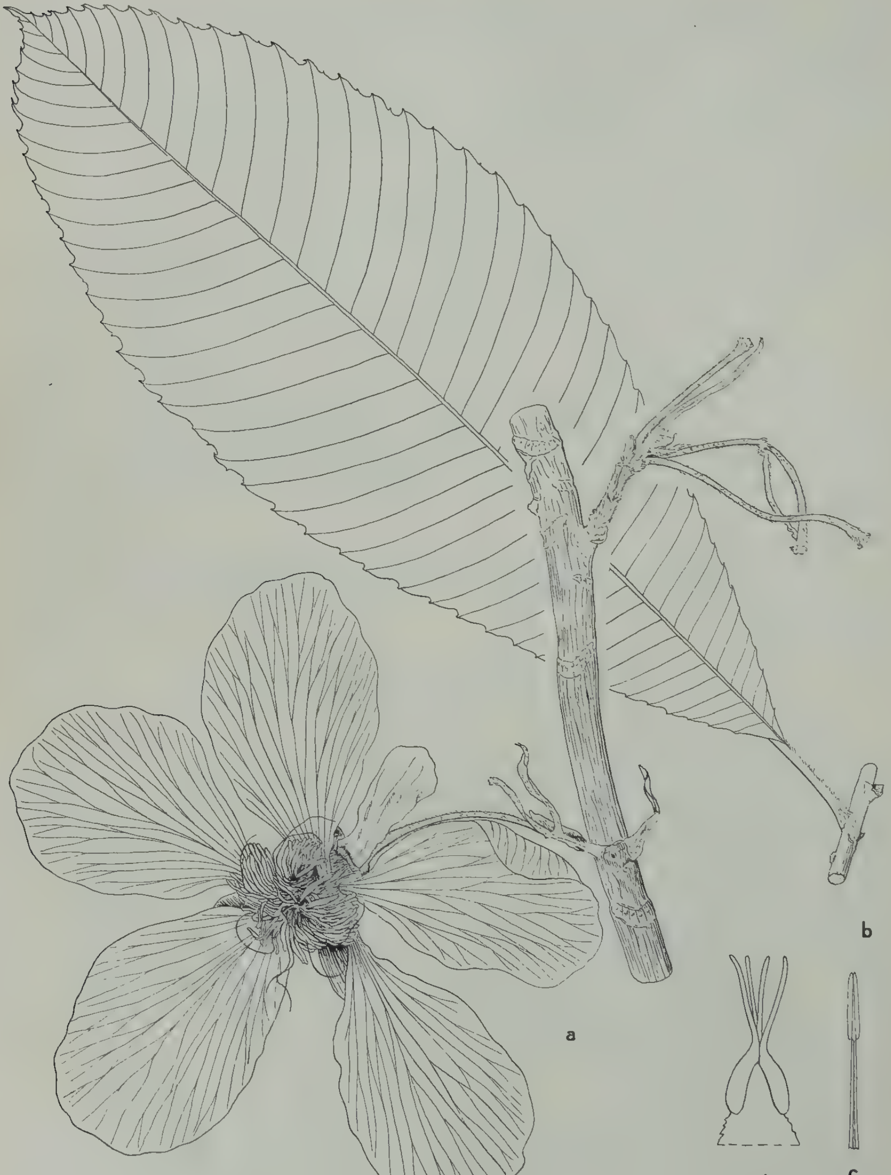


Fig. 11 — *Dillenia parkinsonii* Hoogl. (p. 115); a. flowering branch, × 1; b. leaf, × ½; c. stamen, × 2; d. gynoecium, longitudinal section, × 2; a after *Silviculturist Burma s. n.*, b, c, d after type specimen.

densely strigose beneath. *Inflorescences* fascicled, 2—3 flowers on short shoot lateral on ca 7 mm thick branches or terminal on ca 1 cm long, ca $2^1/_2$ mm thick lateral branch. *Flowers* ca 8 cm across. Pedicel 20—65 mm, ca 1.2—1.7 mm diam., thickened to 3—4 mm at apex, shortly strigose-hirsute, without or with 3 subverticillate bracteoles; bracteoles caducous, linear-oblanceolate, 12—32 × $2^1/_2$—$6^1/_2$ mm, shortly strigose-hirsute on both sides. Sepals 5, 2 outermost ones ovate, ca 20 × 14 mm, 3 innermost ones obovate, ca 23 × 12 mm, all glabrous inside, sparsely shortly strigose-hirsute outside, mainly in central part, ciliate at margin. Petals 5, obovate, ca 40 × 30 mm, rounded at apex, narrowed towards base. Stamens ca 230, slightly curved in bud, all of about same length, ca 11—14 mm long; filament 7—9 mm long, flattened, ca 0.2 mm, near base up to 0.8 mm broad; anther ca 0.8 mm broad, slightly emarginate at apex; thecae linear, opening with apical pore. Carpels 5—7, arranged around conical receptacle, oblong, ca 8 × 2 mm, glabrous, each with ca 14 ovules; styles only slightly diverging, ca 10 mm long, 0.5 mm thick at base, 0.2 mm near apex. *Pseudocarps* indehiscent, about globular, ca 2 cm diam.; carpels ca 10 × 6 mm, each with up to 5 seeds. Seeds obovoid, ca $3^1/_2 \times 3$ mm, dark brown, exarillate.

Burma: Manleikchaung For., Upper Chindwin Divis., *863*, fl. May 1934 (K); *Silviculturist Burma*, fl. 1939 (DD).

Distribution. Burma.

Ecology. The type was collected in "Scrub-Indaing".

Vernacular name. *Wet-zinbyun.*

Notes. 1. I have named this species in honour of Mr C. E. Parkinson, formerly Forest Botanist at Maymyo, who made extensive collections in Burma and published a critical study on some Indian and Burmese Dillenias belonging to the group of deciduous species (Indian Forester 61, 1935, p. 447).

2. The species is the only one belonging to this group with all stamens of about the same length. Though on none of both specimens examined a note is given about the species being deciduous, I expect the species to belong to this group on account of the structure of the inflorescences and of the presence in both collections of leaves, which give the impression of being relatively young and having appeared with or some time after the flowers.

50. Dillenia pentagyna Roxb. 1795

Dillenia pentagyna **Roxb., Pl. Corom. 1, 1795, p. 21, t. 20; Buch.-Ham., Trans. Linn. Soc. 15, 1826, p. 100; Roxb., Fl. Ind. ed. Carey 2, 1832, p. 652; Wight & Arn., Prod. Fl. Pen. Ind. Or. 1, 1834, p. 5; Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 71; Miq., Fl. Ind. Bat. 1, 2, 1859, p. 12; Dalz. & Gibs., Bomb. Fl., 1861, p. 2; Drury, Handb. Ind. Fl. 1, 1864, p. 10; *Beddome, Fl. Sylv. 1, 1869, pl. 104; Hook.f. & Thoms., Fl. Br. Ind. 1, 1872, p. 38; Brand., For. Fl. N.W. & C. Ind., 1874, p. 2; Kurz, For. Fl. Br. Burma 1, 1877, p. 21; *Pierre, Fl. For. Cochinch. 1, 1879, pl. 6—8; Watt. Dict. Econ. Prod. Ind. 3, 1890, p. 114; Koord. & Val., Bijdr. 1 Booms. Java, 1894, p. 163; Gamble, List Darjeeling Distr., Beng., 1896, p. 2; Brand., Ind. Forester 26, 1900, p. 430; Cooke, Fl. Pres. Bomb. 1, 1901, p. 6; Gamble, Man. Ind. Timb. 2nd ed., 1902, p. 6; Duthie, Fl. Upp. Gang. Pl., 1903, p. 21; Prain, Beng. Pl., 1903, p. 195; Brand., Ind. Trees, 1906, p. 4; Fin. & Gagnep., Bull. Soc. Bot. Fr. Mém. 4, 1906, p. 8; Fin. & Gagnep., Fl. Gén. Ind.-Ch. 1, 1907, p. 19; Bourdillon, For. Trees Travancore, 1908, p. 1;

Talbot, For. Fl. Bomb. Pres. & Sind 1, 1909, p. 10; Back., Schoolfl. Java, 1911, p. 11; Koord., Exk. Fl. Java 2, 1912, p. 601; *Koord. & Val., Atl. Baumarten Java 1, 1913, f. 3; Gamble, Fl. Pres. Madras 1, 1915, p. 8; Haines, Bot. Bihar & Orissa 2, 1921, p. 7; *Troup, Sylviculture Ind. Trees 1, 1921, p. 3; Parkinson, For. Fl. Andam. Isls, 1923, p. 72; Cowan & Cowan, Trees N. Beng., 1929 p. 8; Pears. & Brown, Comm. Timb. India 1, 1932, p. 7; Kanjilal, Kanjilal, & Das, Fl. Assam 1, 1934, p. 11; Back., Bekn. Fl. Java (em. ed.) 4, 1942, fam. 80, p. 5; Hoogl., Fl. Mal. I, 4, 1951, p. 172.

Dillenia augusta Roxb., Hort. Beng., 1814, p. 43, nomen nudum; Roxb., Fl. Ind. ed. Carey 2, 1832, p. 652.

Colbertia coromandeliana DC., Syst. 1, 1818, p. 435, based on *Dillenia pentagyna* Roxb. 1795; DC., Prod. 1, 1824, p. 75.

Wormia augusta Steud., Nomencl. ed. 2, 2, 1821, p. 789, nomen nudum.

Wormia floribunda Steud., Nomencl. ed. 2, 2, 1821, p. 789, nomen nudum.

Wormia coromandelina Spreng., Syst. 2, 1825, p. 631, based on *Dillenia pentagyna* Roxb. 1795.

Colbertia augusta Wall., Cat., 1828, no 948, nomen nudum; G. Don, Gen. Hist. 1, 1831, p. 77.

Colbertia floribunda Wall., Cat., 1828, no 950, nomen nudum.

Colbertia minor Zoll. & Mor. in Nat. & Geneesk. Arch. Neêrl. Ind. 2, 1845, p. 579.

Dillenia floribunda Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 71; Hook.f. & Thoms., Fl. Br. Ind. 1, 1872, p. 38.

Dillenia pentagyna var. augusta (Roxb.) Kurz, J. As. Soc. Beng. 43, II, 1874, p. 46.

Dillenia pentagyna var. flavida Pierre, Fl. For. Cochinch. 1, 1879, sub pl. 6—8.

Dillenia pentagyna var. albida Pierre, Fl. For. Cochinch. 1, 1879, sub pl. 6—8.

Dillenia pentagyna var. indica Pierre, Fl. For. Cochinch. 1, 1879, sub pl. 6—8.

Dillenia baillonii Pierre ex Laness., Pl. Util. Col. Fr., 1886, pp. 281, 702, based on *Dillenia pentagyna* Pierre 1879, l.c.; Gilg in Engl. & Prantl, Nat. Pfl. Fam. 3, 6, 1893, p. 128; Fin. & Gagnep., Bull. Soc. Bot. Fr. Mém. 4, 1906, p. 8; Fin. & Gagnep., Fl. Gén. Ind.-Ch. 1, 1907, p. 19; Craib, Fl. Siam. En. 1, 1925, p. 22; Crev. & Pétel., Bull. Econ. Ind.-Ch. Nouv. Sér. 32, 1929, p. 19; Gagnep., Suppl. Fl. Gén. Ind.-Ch. 1, 1938, p. 21.

Dillenia minor (Zoll. & Mor.) Gilg in Engl. & Prantl, Nat. Pfl. Fam. 3, 6, 1893, p. 125.

Dillenia angusta Roxb. ex Hook.f. & Jacks., Ind. Kew. 1, 1895, p. 759, sphalm. for *augusta*.

Dillenia hainanensis Merr., Lingn. Sc. J. 13, 1934, p. 64; Masamune, Fl. Kainantensis, 1943, p. 205.

Type specimens: *Dillenia pentagyna:* Roxburgh, Coromandel; holotype in BM. — *Dillenia augusta:* Wallich 948, HB Calcutta; holotype in K, isotypes in BM, CAL, CGE, G, K. — *Wormia floribunda:* Wallich 950, Salween Riv., 1827; holotype in K. — *Colbertia minor:* Zollinger 2358, Java; holotype in G, isotypes in BM, BZ, FI, MEL, P. — *Dillenia baillonii:* Pierre 661, in prov. Samrongtong, Cambodia, Apr. 1870; lectoholotype in P, isotypes in A, K. — *Dillenia hainanensis:* MacClure 20038, Ngai Distr., Hainan, Apr.—May 1932, flowers only; together with leaf-specimen MacClure 20085 holotype in NY, isotypes in A, G, K, MO, P, UC.

Deciduous trees, up to 25 m high, 100 cm thick, with usually rather crooked, near upper altitudinal limit of species very crooked trunk; crown irregular; bole up to 12 m. Bark smooth, greyish, up to 15 mm thick, peeling off in thin scales. Sapwood white, heartwood brown. Branches not typically sympodial, glabrous, younger ones ca 2—4 mm thick, smooth, older ones with fine longitudinal fissures. Leaf-scars clasping about $^2/_3$ of branch, broadly V-shaped, with ca 19—21 leaf-traces about middle in single or near centre double row. *Leaves* obovate, 20—50 × 10—20 cm, with (15—)25—50 nerves on either side, in young trees and on saplings up to 120 × 40 cm, up to 75-nerved; rounded to obtuse at apex, acute at base, decurrent; margin nearly entire to manifestly dentate with nerves ending in apex of teeth, often with 1, rarely 2, secondary nerves downward 1—3 cm from margin, ending in apex of smaller teeth; dark green, shining, thinly strigose, particularly on nerves, glabrescent above, lighter green, slightly shining, densely more or less appressedly silky hirsute on nerves and midrib, less densely so on intervenium beneath; often small tuft of hairs at end of nerves exceeding margin. Petiole $1^{1}/_{2}$—5(—8) cm, glabrous above, more or less densely strigose-hirsute beneath, slightly winged with non-amplexicaul wings; wings at base up to 3, near base of blade ca 1 mm broad, without venation; in leaves of young trees and saplings wings up to 15 mm broad, not sharply separated from blade, with nervation like blade. *Inflorescences* fascicled, 2—7 flowers on up to 3 mm long short shoot with hairy bracts lateral on 6—30 mm thick branches, rarely at apex of 5—7 mm thick branches. *Flowers* 25—30 mm across. Pedicel $2^{1}/_{2}$—6 cm, ca 0.5 mm thick, glabrous, without bracteoles. Sepals 5, green or purplish, oval, ca 8—12 × 5—9 mm, obtuse to rounded at apex, glabrous on both sides, ciliate at margin, particularly in upper part. Petals 5, yellow, obovate, 15—20 × 5—10 mm, rounded to obtuse at apex, narrowed towards base. Stamens in 2 distinct groups, those of outer group (ca 60—90) slightly curved in bud, $2^{1}/_{2}$—4 mm long, those of inner group (10) with apical part reflexed outward in bud, 6—9 mm long; outside outer stamens often up to 20 staminodes; filament of stamens of outer group flattened, 0.8—3.0 mm long, 0.2—0.4 mm broad, of those of inner group rather thick, 4—7 mm long, at base up to 1.2 mm broad, 0.7 mm thick, narrowed to 0.3 mm at apex; anther of stamens of outer group ca 0.8—1.0 mm broad, of those of inner group ca 1.0 mm broad, 0.7 mm thick with thecae on outer side of connective, at apex nearly reaching each other, at base ca 1 mm from each other; thecae linear, opening extrorse with longitudinal slits. Carpels 5(—6), arranged around rather narrow conical receptacle, lanceolate, ca $3^{1}/_{2}$—4 × 1.2—1.5 mm, glabrous, each with 5—20 ovules; styles spreading, cylindric, ca 4 mm long, at base 0.4 mm thick, channelled above. *Pseudocarps* indehiscent, yellow, orange, or red, about globular, slightly flattened, ca 15 mm diam., 13 mm high including enclosing sepals which are up to 16 × 14 mm, up to 3 mm thick at base; carpels ca 8 × 5 mm, each 1(—2)-seeded. Seeds ovoid, ca 5 × $3^{1}/_{2}$ mm, black, glabrous, exarillate.

India: *Schlich* (K); *Rottler* (K); *Voigt*, fl. (C); *Wallich*, fl. & fr. (G); *Wight 3027*, fl. (CAL); NW. India, *Stewart*, fl. 1871 (E). — South. Himalaya Region: Sikkim Terai, *Anderson* (CAL); Sikkim, *Hooker & Thomson*, Aug. 1848 (GH, K, P); Sikkim Terai, Feb. 1867 (CAL); ibidem, *Kurz*, Oct. 1868 (CAL); ibidem, *Kurz* (CAL, K); Darjeeling Terai, *Clarke 12061*, June 1870 (K); Sikkim Terai, Siooke, *Gamble 3873*, fl. March 1873 (DD, K); Bamanpohri, Darjeeling Terai, *Lace 2185*, fl. March 1902 (E, K); Senohe Terai, *Cave*, March 1913 (CAL). — United Provs: Oudh, *Wallich 949* (K); Gorakpur & Mongro Hills, *Hamilton 1259 (= Wallich 949 p.p.)*, fl. & veg. June 1811 & Apr. 1814 (E, K); N of Indalpur, Shahjahanpur, Oct. 1885 (DD); near Wardagwram, Gonda Distr., *Duthie 9267*, Jan. 1890 (DD); Ramgarh, Gorakpur Distr., *Harsukh 21446a*, March 1898 (CAL, DD, K); Didburiyá, Kheri Distr., *Inayat 21446b*, Apr. 1898 (DD); Gorakpur Distr., *Harsukh 21446*, fl. Apr. 1898 (CAL, DD, K); Nishangarah, Bharaich Distr., *Harsukh 21447*, July 1898 (CAL, DD, K); Sungarhá, Gonda Distr. (Oudh), *Inayat 23549*, fl. May 1900 (L); Dudwa, *Haines 2106*, Feb. 1906 (DD, K); Sotiana For., N. Kheri, *Sis Ram*, fl. & fr. May 1920 (DD, SING). — Centr. Provs: Kandu Range, Melghat, *M 9* (DD); ibidem, *Berar 8014* (DD); *Donald*, Jan. 1910 (DD). — Behar & Orissa: Ma Beharinatkim, Manbhum, *Kurz* (BZ, CAL); Dadku Manbhum, *Wood*, Dec. 1879 (CAL); Parasnath, Hazaribagh, *Clarke 34780*, fl. & fr. Apr. 1884 (BM, G, K); Singbhum, *Haines 536*, Dec. 1902 (K); Balikhal, Mayurbhanj, fl. Apr. 1939 (DD); Kuldiha, Nilgiri State, Orissa, *Mooney 2034*, fl. Apr. 1942 (K). —

Deccan Pen.: Coromandelia, fl. (C); Coromandel, *Roxburgh*, fl. (BM); Concan, *Law*, fl. (BM, CAL, CGE, G, GH, K, L, M, P, UPS); Kimedi Mts, Circars, *Rupel* (BM); Courtallam, *Wight 14*, fr. March 1835 (K); ibidem, fr. Apr. 1835 (E); ibidem, *Wight*, Feb. 1836 (E); Paulghautchirry, *Wight 14*, Aug. 1844 (K); Nautacoo, Marumi, Courtallam, *Wight 22*, fr. (CGE, E, GL, K); *Wight 14*, fl. (C, GH, L, MEL, P); Moollis, *Ritchie 297*, fl. Feb. 1853 (K); ibidem, *Ritchie*, fl. Feb. 1853 (E); Canara & Ghats, *Ritchie 297*, fr. May 1853 (K); Ghats & Kula Midde, *Ritchie 297*, Apr.—June (K); Chandwar in Canara, *Ritchie 297*, fr. (E); Sirivaka, Godavery Distr., *Bourne*, Feb. 1902 (CAL, K); Taliparamba, Malabar, *Barber 7730*, fr. May 1906 (CAL); Dhoni, S. Malabar, *Fisher 1825*, fr. March 1910 (CAL); Pambadi Trao, *Meebold 12732*, Dec. 1910 (CAL); Anaimalai Hills, *Fisher 3367*, fl. Apr. 1912 (CAL); Travancore, Konney, *Calder & Ramaswami 80*, Aug. 1913 (CAL); Rampa Hills, Godavery Distr., *Ramaswami 1544*, Aug. 1914 (CAL); ibidem, *Narayanaswami 173*, Sept. 1920 (CAL). — Bengal: Chittagong, *Hooker & Thomson* (GH, K, P); Sorukpore, *Neary*, fl. (K); Ooiphoon Range, Chittagong, *Lister 262*, fl. March 1876 (CAL); Situpuhar Res., Chittagong, *Ellis 31*, fl. Apr. 1885 (CAL); Kodala Hill near Chittagong, *Badul Khan 421*, fl. & fr. Apr. 1887 (CAL, UPS); Shanmura W of Agartala, Tipperah, *Debbarman 401*, Dec. 1914 (CAL). — Assam: Outer Khasia Hills, below Jeerung, *Schlich* (DD); Inmoon Falls, *Masters*, March 1845 (CAL); *Hooker & Thomson*, July 1850 (K); Bhramaputhra Plains, *Kurz 155*, fl. March—Apr. 1876 (CAL, DD); Limatak, W. Manipur, *Watt 7173*, May 1882 (CAL); Nya Bungalow, Khasia, *Clarke 38139*, fl. May 1885 (K); Sheelgat, Nowgong, *Clarke 43201*, fl. March 1886 (CAL); Kaudlair, Lushai Hills, *Parry 213*, fl. (K); Marwaungklang, Lushai Hills, *Parry 513*, Jan. 1928 (K, SING).

Ceylon: *Wight 15*, fl. (E).

Burma: Mya-oang, *Buchanan* (BM); Salween, *Wallich 950*, fl. Feb. 1827 (K); Paklun, *Brandis 1216*, Oct. 1861 (MEL); Tonkyaghat, Pellowa Zeik, *Kurz 38*, fl. (CAL); Pegu, *Kurz 1806* (CAL); Kalein Res., S. Pegu, *Bo Pu 2539*, fl. March 1926 (DD); Rangoon, *Scott*, fl. Feb. 1934 (DD); Insein, Myaukhaing Res., *Po K'Laut 168*, fl. March 1948 (DD).

Andaman Islands: Bomlungta, *Parkinson 925*, Feb. 1916 (CAL, DD); *Convict*, fl. & fr. 1918 (CAL).

China: Yunnan: Maan-bang, Dah-meng-lung, Che-li-hsien, *Wang 76356*, fr. Aug. 1936 (A). — Hainan: Sin Woh, Taam Chau Distr., *Tsang 351 LU 17100*, fr. May 1928 (A, BM, E, G, K, MO, NY, P, UC); near Po-ting, Lingshui Distr., *Liang 61542*, fr. Apr. 1932 (A, NY); Chim Shan, Fan Maan Ts'uen & Vicinity, Lingshui Distr., *MacClure 20038 & 20058*, fl. & veg. May 1932 (A, G, MO, NY, P); Yaichow, *How 70322*, fl. March 1933 (NY, SING); Ka Chik Shan & Vicinity, Ch'ang Kiang Distr., *Lau 1743*, fr. May 1933 (A, BM, NY, P); *Wang 32899*, fl. July 1933 (A, NY); Yaichow, *Liang 62066*, fr. July 1933 (NY); Yeung Lam Shan, near Yeung Lam Villang, Yai-hsien Distr., *Lau 6232*, fr. May 1935 (A).

Siam: Payap: Chiengrai, *Kerr*, fl. March 1921 (P, UC). — Udawn: Lôi, Kao Krading, *Kerr 8746*, fl. March 1924 (BM, E, K, P, UC); ibidem, *Kerr 20039*, fl. Feb. 1931 (BM). — Rachaburi: Sai Zok, Kanburi, *Kerr 10556*, fl. Feb. 1926 (BM).

Indo-China: Mekhong, *Thorell*, fl. 1866—8 (P). — Tonkin: Phu Tho, *Eberhardt 5051*, fl. (P). — Annam: San Thays Mts, Hué, *Harmand*, 1875—7 (P); Mekong-Hué road, *Harmand (= Pierre 1875)*, fr. Sept. 1877 (P); Laobao, Quang Tri Prov., *Poilane 1356*, fl. Apr. 1920 (P). — Cambodia: Samrongtong Prov., *Pierre 661*, fr. Apr. 1870 (A, P); Kompong Chhnang, *Godefroy 233*, June 1875 (K, P); Melouprey, *Harmand 444*, fl. Feb. 1876 (K, P); Dêt Prov., *Harmand (= Pierre 2047)*, fr. Jan. 1877 (P); Chéomkhsan, Shung Treng Prov., *Poilane 14889*, fr. March 1928 (P); Love, *Béjaud 401*, fl. (A, NY, P). — Cochinchina: *Pierre* (P); *Thorell* (P); *Thorell 1335*, 1862—6 (P); Bien Hoa, *Thorell*, 1862—6 (P); Dinh Mts, *Pierre 2046*, Aug. 1866 (BM, L, P); Dinh Mts (Mu Xoai), Baria Prov., *Pierre 2045*, Sept. 1867 (BM, K, L, P); Dinh Mts, *Pierre 661*, Aug. 1869 (K, P); ibidem, *Pierre 661*, fr. Oct. 1870 (A, BM, L, NY); Song Lu, Bien Hoa Prov., *Pierre 1601*, fl. Feb. 1877 (BM, K, L); ibidem, *Pierre 599*, fl. & fr. Feb. 1877 (P); Dan Man, Bien Hoa Prov., *Pierre 1601*, fl. March 1877 (P); between Quanloi & Xa Huat near Honquan, *Evrard 872*, fr. Apr. 1922 (P).

Java: *de Voogd 200 (725)* (L). — W. Java: Kuningan, Cheribon, *Houter 159*, March 1873 (BZ); Tomo, Preanger, *Koorders 1630 β*, May 1890 (BZ, P); ibidem, *Koorders 1633 β*, May 1890 (BZ); ibidem, *Koorders 1629 β*, fr. July 1891 (A, BZ, K, L); ibidem, *Koorders 1635 β*, *1636 β*, *1637 β*, *1638 β*, July 1891 (BZ); ibidem, *Koorders 11874 β*, Apr. 1893 (BZ); between Tjitepong & Tjiletus, *Backer 17597*, fl. Nov. 1914 (BZ). — C. Java: Djocjacarta, *2837 HB* (BZ); Kedungdjati, *Koorders 1697 β*, May 1888 (BZ); ibidem, *Koorders 1599 β*, fl. July 1888 (BZ); ibidem, *Koorders 1590 β*, fl. Aug. 1888 (A, BZ, L); ibidem, *Koorders 1600 β*, fl. Aug. 1888 (BZ); ibidem, *Koorders 1605 β*, fl. & fr. Aug. 1888 (BZ); ibidem, *Koorders 1592 β*, *1593 β*, *1596 β*, fr. Oct. 1888 (BZ); ibidem, *Koorders 1591 β*, fr. Oct. 1888 (BZ, K, L); ibidem, *Koorders 1595 β*, fl. & fr. Sept. 1889 (BZ); ibidem, *Koorders 1601 β*, fr. Oct. 1889 (BZ); ibidem, *Koorders 1606 β*, fl. & fr. Oct. 1889 (A, BZ, L); ibidem, *Koorders 1604 β*, Oct. 1889 (BZ); ibidem, *Koorders 1603 β*, Nov. 1889 (BZ); ibidem, *Koorders 1598 β*, fl. Aug. 1890 (BZ); Darmotemulus, Brebes, Tegal, *Koorders 1611 β*, Sept. 1891 (BZ); Margasari, Brebes, Tegal, *Koorders 1613 β*, Sept. 1891 (BZ, L); Subah, Pekalongan, *Koorders 11424 β*, Oct. 1891 (BZ); ibidem, *Koorders 11425 β*. Feb. 1892 (BZ); Karangassam, Semarang, *Koorders 1610 β*, March 1892 (BZ); Karangassam, *Koorders 1620 β* (BZ); Kedungdjati, *Koorders 25115 β*, fl. & fr. Sept. 1896 (BZ, L); Karangassam, *Koorders 28247 β* June 1897 (BZ); ibidem, *Koorders 33252 β* (BZ, L); Subah, Pekalongan, *Koorders 36922 β*, fl. May 1899 (BZ); Ngarengan, Taju, *Koorders 35492 β*, June 1899 (BZ); Ngandang, *Koorders 36515 β*, Nov. 1899 (BZ); Telawah, *NIFS K 7*, fr. (BZ); Margasari, *Beumée 515*, Nov. 1915 (BZ); Subah, *Beumée 3470*, fr. Oct. 1918 (BZ); Prupuk, Pekalongan, *Noltée 4033*, fl. Sept.—Oct. 1919 (BZ, WAG); Rembang, Kunduran, *Beumée 5248*, fl. Aug. 1920 (BZ); Semarang, Manggar, *Jansen 4652*, fr. Dec. 1922 (BZ); Telawa, Semarang Distr., *Vincent 4652a*, fr. Dec. 1923 (BZ); near Dk Masargin, Tambakredjo, *NIFS Ja 1598*, Apr. 1927 (BZ). — E. Java: near Gondang Malang, *Zollinger 2358*, fl. & fr. Oct. 1844 (BZ, FI, G, MEL, P); Badjulmati, Banjuwangi, *Koorders 1586 β*, May 1889 (BZ); Puger-Watangan, *Koorders 1581 β*, fl. Aug. 1889 (BZ, L, P); Rogodjampi-Balak, *Koorders 1587 β*, Aug. 1889 (BZ); Puger-Watangan, *Koorders 1582 β & 1588 β*, fr. Oct. 1889 (BZ); ibidem, *Koorders 1583 β*, fr. Oct. 1889 (BZ, P); Tjuramanis, Simpolan, Majang Distr., *Koorders 1585 β*, fr. Dec. 1889 (BZ, K, L, P); ibidem, *Koorders 1584 β*, fr. Jan. 1892 (BZ); Ngebel, Pulung Distr., *Koorders 1609 β*, fr. Oct. 1892 (BZ, CAL, K, L, WAG); ibidem, *Koorders 1607 β*, fl. Oct. 1892 (BZ, L); ibidem, *Koorders 1608 β*, fl. & fr. Oct. 1892 (BZ, K, L, P); Puger-Watangan, *Koorders 12895 β & 12896 β*, fr. Nov. 1892 (BZ); Pantjur-Idjen, Pradjekan Distr., *Koorders 20731 β*, fl. Nov. 1895 (BZ); Gadungan Pare, Sukaradja Distr., *Koorders 22743 β*, June 1896 (BZ, L); Ponorogo, Madiun, *Koorders 29206 β*, fl. Aug. 1897 (BZ, L); Ngandang, Sedan Distr., Gunung Gerang, *Koorders 36127 β*, June 1899 (BZ); Tjuramanis, *Koorders 38473 β*, fr. Nov. 1899 (BZ); Brombang near Ngebel, *Koorders 38719 β*, fr. Nov. 1900 (BZ); Puger, *Koorders 39777 β & 39840 β*, May 1902 (BZ); Tjuramanis, *Koorders 40026 β*, May 1902 (BZ); Pilangredjo, Madiun, *Wisse 46 & 59*, May 1919 (BZ); Dero (N of Padas), Madiun, *Wisse 117*, fr. Sept. 1919 (BZ); Bodjonegoro, Tjelebung, Bubuton, Rembang Distr., *NIFS Ja 1629*, July 1927 (BZ); Baluran, Bondowoso Distr., *Clason A 105*, fl. Nov. 1930 (GRO); Bodjonegoro, near Klino, *NIFS Ja 2039*, Jan. 1931 (BZ, K, L); Glenmore, *Rant*, fl. July 1931 (BZ). — Kangean Arch.: Kangean, between Ardjasa & Gelaman, *Backer 27160*, March 1919 (BZ); Kangean, Budhi, *Dommers 17*, fl. Sept. 1919 (BZ).

Lesser Sunda Islands: Sumba: Muamarra, *Iboet 452*, May 1925 (BZ, L). — Timor: fl. (BZ); Dilly, fl. (BZ); *Teysmann*, fr. (BZ); *Teysmann 10667 HB*, fl. (BZ, FI). — Wetar: near Klisana, *Bloembergen 172 (= NIFS bb 27288)* (A, BZ, L); near Tarra, *Bloembergen 3772*, Apr. 1939 (BZ, L).

Celebes: SW. Peninsula: Saepa Galung, Pare-pare, *Noerkas 296*, fl. June 1912 (BZ, L); Tanette, Parigi Distr., *Bünnemeyer 12558*, fl. June 1921 (BZ, L); Malino above Makassar, *Rant 433*, fl. & fr. Oct. 1931 (BZ, L). — Pulau Muna: near Raha, *NIFS bb 5864*, fl. & fr. Aug. 1923 (BZ).

Cultivated: Calcutta: *Wallich 948*, fr. (BM, CAL, CGE, G, K); *Wallich 949*, fr. (CAL, CGE, K); fl. (BZ, CAL, L, M, NY, P); *Kurz* (BZ, CAL); *Pierre*, fl. 1863—4 (P). — Bot. Gard. Bogor: no IV-G-13a, fl. Sept. 1892 & fr. (BZ, CAL, L, US); no IV-G-15 (BZ); no IV-G-19a, fr. (BZ); For. Res. Inst. Gard., cultivated from Noltée 3033, Margasari, Jan. & June 1922 (BZ; seedlings). — Bot. Gard. Hanoi: *Lemaire*, fl. (P); *Chevalier 29764*, Dec. 1913 (P).

Locality uncertain: (E); *Cleghorn* (E); *29*, fr. (DD); between Kysaphur & Soonorry For., *Wallich 949 (303)*, fl. March 1819 (K); Besarbati, fl. Apr. 1850 (K); Punkaban, *Clarke 13843*, Nov. 1870 (BM); Hishangabat Distr., *Hole 854*, Jan. 1908 (DD).

Distribution. India, Burma, Andaman Islands, China (Yunnan, Hainan), Siam, Indo-China, Java (not in the westernmost part), Lesser Sunda Islands, South Celebes. The area of the species shows a remarkable resemblance to that of *Tectona grandis* L.f. (cf. Hoogl., l. c. fig. 12).

Ecology. The species generally occurs in open forests to savannahs, in India in Sal forest (*Shorea* spec.), savannah forest, or mixed plains forest, where it is usually small, whereas on the hills it may be a fine large tree (Cowan & Cowan, l. c.); in Java common in teak forests. It flowers when leafless in the dry season, in Continental Asia from January to June, in Malaysia from June to November; each tree has only a short time of flowering.

Vernacular names. In the literature mentioned above a very large number of vernacular names has been noted for the species in India and Burma. Unfortunately on the herbarium labels rarely names are noted and therefore it is impossible to decide whether all these vernacular names refer to the present species; the total number exceeds 50. From Pearson & Brown, l. c. I cite the vernacular names as these will probably be the most common and reliable ones: *Akshi* (Assam); *Akachi, Achki* (Garo); *Karhotta* (Bengal); *Sahar* (Santhali); *Tatri* (Nepalese); *Karmal, Karambel, Kurweil* (Marathi); *Kanagola* (Kanarese); *Zinbyun* (Burmese); *Mai, Mak-san* (Shan); *Graw-grawp* (Kachin); *Khaw* (Karen); *Kalot* (Tg.); *Rai, Pinnai, Nai-tek* (Tamil); *Rawandan, Chinna-kalinga* (Telugu). Outside India and Burma the following names have been noted: Hainan: *Taai Ip Pei Pa Shue.* Siam: *Peng* (Lao, Nakawn Panom), *San do de* (Kao Krading). Indo-China: *Cay mi* (Annamese), *Meroi* (Moi), *So ba* (Annamese). Java: *Djunte* or *Djunti* (Sundanese), *Sempu* (Javanese), *Sompor* (Madurese), *Sumpor* (Kangean). Lesser Sunda Isls: *Hakki* (Sumba), *Kamatato* or *Paponuk* (Wetar). Celebes: *Tawro* (SW. Cel.), *Rondomi* (Munarese).

Uses. The timber is extensively used in India under cover for houseposts, rafters, and planking, and may be used for decorative work. In Java it is not used, probably because no large trees are available, except for making charcoal, which is of good quality. The fruit is eaten in curries and jellies and also used for making a cough cure.

Notes. 1. The colour of the petals in practically all cases is indicated as yellow, except by Pierre (1879) who distinguishes 3 varieties which also differ by the colour of the sepals: *var. flavida* sepals purple, petals yellowish; *var. albida* sepals greenish, petals whitish; *var. indica* sepals greenish, petals yellow. Other differences are not indicated and I have not been able to distinguish these varieties in the herbarium specimens.

2. *Dillenia baillonii* was proposed as a distinct species by Pierre in manuscript; the first to use the name was Lanessan without description, but with reference to *Dillenia pentagyna* Pierre non Roxb., which therefore was a valid publication. The differences given by Pierre are: less accentuated crenatures and a more obovate blade. To this Finet & Gagnepain added differences in the number of nerves (47 in *pentagyna*, 30—37 in *baillonii*) and in the indument of pedicels and flowers (glabrous in *pentagyna*, hairy in *baillonii*). In the type of *D. baillonii* and all other specimens from Indo-China the pedicels and flowers are glabrous, whereas

the other differences fall within the variability of *D. pentagyna* as delimited here.

51. Dillenia scabrella (D. Don 1825) Roxb. ex Wall. 1830

Dillenia scabrella Roxb., Hort. Beng., 1814, p. 32, nomen nudum; **Wall., Pl. As. Rar. 1, 1830, p. 20, t. 22; Roxb., Fl. Ind. ed. Carey 2, 1832, p. 653; Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 70; Drury, Handb. Ind. Fl. 1, 1864, p. 10; Hook.f. & Thoms., Fl. Br. Ind. 1, 1872, p. 38; Kurz, J. As. Soc. Beng. 43, II, 1874, p. 46; Kurz, For. Fl. Br. Burma 1, 1877, p. 21; Brandis, Ind. Forester 26, 1900, p. 430; Gamble, Man. Ind. Timb. 2nd ed., 1902, p. 6; Prain, Bengal Pl., 1903, p. 195; Brandis, Ind. Trees, 1906, p. 4; Fin. & Gagnep., Bull. Soc. Bot. Fr. Mém. 4, 1906, p. 7; Fin. & Gagnep., Fl. Gén. Ind.-Ch. 1, 1907, p. 18; Kanjilal, Kanjilal, & Das, Fl. Assam 1, 1934, p. 11.

Colbertia scabrella (Roxb. nomen nudum) D. Don, Prod. Fl. Nep., 1825, p. 266.

Dillenia pilosa Roxb., Hort. Beng., 1814, p. 43, nomen nudum; Buch.-Ham., Trans. Linn. Soc. 15, 1827, p. 102; Roxb., Fl. Ind. ed. Carey 2, 1832, p. 652.

Wormia scabrella (D. Don) Spreng., Syst. 4, Cur. Post., 1827, p. 213.

Dillenia elata *Pierre, Fl. For. Cochinch. 1, 1879, t. 9; Laness., Pl. Util. Col. Fr., 1886, p. 281; Fin. & Gagnep., Bull. Soc. Bot. Fr. Mém. 4, 1906, p. 8; Fin. & Gagnep., Fl. Gén. Ind.-Ch. 1, 1907, p. 18; Gagnep., Suppl. Fl. Gén. Ind.-Ch. 1, 1938, p. 20.

Type specimens: *Colbertia scabrella:* Wallich 944, Cult. in Bot. Gard. Calcutta; holotype in K, isotypes in BM, BR, CAL, G, K, NY, P. — *Dillenia pilosa:* Wallich, cult. in Bot. Gard. Calcutta, Apr. 1818; holotype in K, isotypes in C, CGE. — *Dillenia elata:* Pierre 765, Chiruw Mts, Samrongtong Prov., Cambodia, Apr. 1876; lectoholotype in P, isotype in A.

Deciduous trees, up to 30 m high, ca 100 cm thick. Bark smooth, grey, red, or brown. Wood brown. Branches not typically sympodial, younger ones ca 3 mm thick, slightly hirsute to densely strigose, glabrescent. Leaf-scars clasping about $^2/_3$ of branch, broadly V-shaped with ca 15 leaf-traces near upper margin. *Leaves* obovate to narrowly obovate, 15—30(—35) × 6—14(—16) cm, with (25—)35—45(—50) nerves on either side; rounded to acute at apex, obtuse to acute at base, decurrent; margin slightly dentate to nearly entire, nerves rather straight, slightly curving upward near margin, ending in apex of teeth, sometimes smaller tooth between 2 nerves with vein ending in it; shortly hirsute with rather rigid hairs, glabrescent, often more or less scabrid above, rather densely softly strigose-hirsute, mainly on midrib, nerves, and veins, usually less scabrid beneath. Petiole $2^1/_2$—5(—8) cm, glabrous above, softly strigose-hirsute beneath, with ca 1—2 mm broad non-amplexicaul wings. *Inflorescences* fascicled, (1—)2—5 flowers on up to 3 mm long short shoot with small caducous hairy to nearly glabrous bracts lateral on ca 5—10 mm thick branches, rarely at apex of ca 5 mm thick branches. *Flowers* ca 4—5 cm across. Pedicel ca 2—4 cm, in fruit up to 6 cm long, ca 1—$1^1/_2$ mm thick, thickened to ca 2 mm at apex, in fruit ca 2 mm thick, thickened to ca 3 mm at apex, sparsely hirsute near base, glabrous towards flower, partly with 2—3 bracteoles at same or slightly different level from closely near base to ca 1 cm below flower; bracteoles caducous, lanceolate, up to ca 8 × $2^1/_2$ mm, glabrous above, sparsely strigose along midrib and in apical part beneath, ciliate at margin. Sepals 5, 2 outermost ones ovate, ca 12 × 10 mm, 3 innermost ones oval, ca 14 × 10 mm, glabrous on both sides, sparsely ciliate at margin near apex only. Petals 5, bright yellow, narrowly obovate, ca 25 × 10 mm, rounded at apex. Stamens in 2 distinct groups, those of outer group (ca 110) slightly curved in bud, ca 4—5 mm long, those of inner group (ca 18) with apical part reflexed outward in bud, 9—10 mm long; filament of stamens of outer group ca 1—2 mm long, 0.3—0.4 mm broad, of those of inner group rather thick, ca 5 mm long, 0.6 mm broad, 0.6 mm thick; anther of stamens of outer group ca 0.4 mm broad, of those of inner group ca 1.0 mm broad, 0.4 mm thick with thecae on outer side of connective, in stamens of outer group rounded to obtuse at apex, in those of inner group slightly emarginate at apex; thecae linear, opening with longitudinal slits, in stamens of outer group lateral, in those of inner group on outer side. Carpels 5—7, arranged around rather narrow conical receptacle, ovate-oblong, ca $4^1/_2 \times 1^1/_2$ mm, glabrous, each with ca 8—10 ovules; styles recurved to slightly spreading, ca 8 mm long, ca 0.5 mm thick at base, 0.3 mm near apex, channelled above. *Pseudocarps* indehiscent, orange, about globular, ca 24 mm diam., 20 mm high including enclosing sepals which are up to ca 30 × 22 mm, ca 4 mm thick near base; carpels ca 12 × 7 mm, each with 0—2 seeds. Seeds obovoid, ca $5 \times 3^1/_2$ mm, glossy black, glabrous, exarillate.

India: Bengal: Kesalong, Chittagong Hill Tracts, *Lister 377*, fr. 1876 (CAL). — Assam: Camrupe Mts, Goalpara, *Hamilton 1258* (= *Wallich 944)*, fl. Aug.—Sept. 1808 (E, K); Khasia Mts, *Hooker & Thomson*, fr. (CAL, CGE, GH, K, P); Lower Assam, *Mann 140* (CAL); Dhansiri, Nowgong Distr., *Kanjilal*, fl. Apr. 1914 (CAL).

Burma: Padaung, near Hampyi, Southern Shan States, *Robertson 140*, fl. March 1910 (K).

Indo-China: Laos: between Na Mo & M. Luang Nam Tha, Haut Mekhong Prov., *Poilane 26210*, fr. May 1936 (P); between Vieu Poukha & Tafa, Haut Mekhong Prov., *Poilane 26411*, fr. June 1936 (P). — Cambodia: Chiruw Mts, Samrongtong Prov., *Pierre 765*, fr. Apr. 1876 (A, P). — Cochinchina: Bao Chiang, Bien Hoa Prov., *Pierre 2041*, Sept. 1865 (A, BM, K, P).

Cultivated: Calcutta Bot. Gard.: fl. & fr. (BZ, CGE, L, P); *Wallich*, fl. (CAL, K); *Voigt* (C); *Wallich*, Apr. 1818 (C, CGE, K); *Wallich*, fl. 1819 (BM, G, K, LINN); *Wallich 944 & 944A*, fl. (BM, BR, CAL, CGE, G, K, NY, P); *Griffith*, fl. (K); fr. 1851 (CAL); *Kurz*, fl. (CAL, K); *Pierre 2943*, fl. Feb. 1863 (K, P). — Bot. Gard. Bogor: no IV-G-12, fl. 1915 & fr. (BZ). — Bot. Gard. Mauritius: fl. (CGE, K).

Without locality: *Wallich* (C); *Chuma*, June 1850 (K).

Distribution. Bengal, Assam, Burma, and Indo-China; possibly also Nepal.

Ecology. In forests, up to ca 1300 m altitude. As far as the few collections indicate, the flowering and fruiting time agree with those of *D. pentagyna* (flowering from January to June).

Vernacular names. *Daine oksi* (Assam; Buch.-Ham.); *Banjiou* (Ass.), *Mandiphang* or *Mundephang* (Kuki), *Agatchi-badura* (Garo; fide Kanjilal, Kanjilal, & Das 1934); *So bà nui, Pelou phom* (Indo-China; fide Pierre 1879).

Uses. The wood is of good quality; the fruits are edible.

Notes. 1. The occurrence in Nepal is recorded by D. Don (1825) on account of a specimen collected by Wallich; in the Calcutta herbarium one of the specimens of Wallich from the Botanic Garden bears besides the indication "Nepal". From these data the occurrence in Nepal can not be considered as certain.

2. The first description of the species, and therefore the first valid publication of the epithet *scabrella*, was given by D. Don under the name

Colbertia scabrella D. Don; Wallich was the first to use the combination "*Dillenia scabrella* Roxb." valid under the Rules, however without citing *Colbertia scabrella* D. Don. As both are based on the same specimen (*Dillenia scabrella* Roxb., Hortus Bengalensis 1814, published only as a nomen nudum) I have treated Wallich's binomial as if it were based on *Colbertia scabrella* D. Don, thus giving it priority to *Dillenia pilosa* Roxb. ex Buch.-Ham..

3. As the type of *D. pilosa* I consider a specimen from cultivation in the Botanic Garden at Calcutta, probably from the specimen on which Roxburgh based his new species, which was published only as a nomen nudum. The first valid description was given by Buchanan-Hamilton, who cited a specimen from Assam; it is not certain whether he compared this specimen with Roxburgh's material.

52. Dillenia parviflora Griff. 1854

Dillenia parviflora Griff., Notul. 4, 1854, p. 704; Kurz, J. As. Soc. Beng. 40, II, 1871, p. 45; Kurz, J. As. Soc. Beng. 43, II, 1874, p. 46; Hook.f. & Thoms., Fl. Br. Ind. 1, 1875, p. 38; Kurz, For. Fl. Br. Burma 1, 1877, p. 21; Watt, Dict. Econ. Prod. Ind. 3, 1890, p. 113; Brand., Ind. Forester 26, 1900, p. 430; Gamble, Man. Ind. Timb. 2nd ed., 1902, p. 6; Pears. & Brown, Comm. Timb. India 1, 1932, p. 6.

Dillenia kerrii Craib, Kew Bull. 1911, p. 8; Craib, Fl. Siam. En. 1, 1925, p. 23.

Dillenia elata Auct. non Pierre; Craib, Fl. Siam. En. 1, 1925, p. 22.

Type specimens: *Dillenia parviflora:* Griffith 50, Mergui; holotype in K. — *Dillenia kerrii:* Kerr 1046, hills between Muang Proa and Chiengdao, Siam, 5 March 1910; holotype in K, isotype in BM.

Deciduous trees, up to 40 m high, 100 cm thick. Branches not typically sympodial, younger ones ca 3 mm thick, more or less densely shortly hirsute, glabrescent. Leaf-scars clasping about $^3/_5$ of branch, subfalcate with ca 17—21 leaf-traces in upper part. *Leaves* obovate to elliptic-oblong, (11—)15—25(—30) × (6—)8—$12^1/_2$(—15) cm, with 25—35(—40) nerves on either side, in young trees and on saplings up to 37 × 15 cm with 44 nerves on either side; rounded to obtuse, often slightly acuminate at apex, obtuse, nearly rounded, to acute at base, decurrent; margin entire to shortly dentate, nerves rather straight to slightly curving upward, ending in margin; slightly scabrid, shortly hirsute, soon glabrescent on nerves and intervenium, densely shortly hirsute on midrib above, slightly scabrid, more or less densely hirsute, not glabrescent, on intervenium, nerves, and midrib beneath. Petiole $1^1/_2$—$3^1/_2$(—5) cm, densely hirsute on both sides. *Inflorescences* fascicled, (1—)2—4(—7) flowers on up to 3 mm long short shoot with caducous bracts lateral on 5—10 mm thick branches, rarely at apex of ca 3—4 mm thick branches; bracts up to 15 × 7 mm, densely sericeously hirsute on both sides. *Flowers* ca 5 cm across. Pedicel 5—30(—60) mm long, ca 1—$1^1/_2$ mm thick, rather densely hirsute, without or with 1 or 2 bracteoles; bracteoles caducous, linear-lanceolate, ca 10 × 2 mm, densely hirsute. Sepals 5, oval, ca 12—16 × 7—10 mm, glabrous except up to 2 mm broad shortly hirsute part at apex of 2 outermost ones inside, densely sericeously hirsute except in bud covered margins which are glabrous for ca 0.7—1.0 mm outside, ciliate at margin. Petals 5, yellow, obovate, ca 25 × 12 mm, rounded at apex, narrowed towards base. Stamens in 2 distinct groups, those of outer group (ca 140—170) slightly curved in bud, ca 5—$6^{1}/_{2}$ mm long, those of inner group (ca 11—14) with apical part reflexed outward in bud, ca 12—15 mm long; filament of stamens of outer group 1.2—3.0 mm long, ca 0.3—0.4 mm broad, of those of inner group ca 7—9 mm long, at apex 0.3, at base up to 1.0 mm broad; anther 0.8—1.0 mm broad, slightly emarginate at apex; thecae linear, opening with longitudinal lateral slits. Carpels 5—8, arranged around rather narrow conical receptacle, lanceolate, $4^{1}/_{2}$—5 × 1.3 mm, glabrous, each with 12—16 ovules; styles recurved, ca 7 mm long, at base ca 0.7, near apex ca 0.2 mm thick and broad. *Pseudocarps* indehiscent, orange, about globular, ca 18 mm diam., 17 mm high including enclosing sepals which are up to 23 × 15 mm; carpels ca 13 × 7 mm, each with 1—4 seeds. Seeds obovoid, ca 5 × $3^{1}/_{2}$ mm, black, exarillate.

var. parviflora

Dillenia parviflora Griff. 1854.

Carpels glabrous.

Burma: Mergui, *Griffith 50*, fl. (K); Youngeleen, *Brandis 1215*, fl. March 1862 (MEL); Pegu, Tonkyeghat, Palawa Zeik, *Kurz 39 (320)*, fl. (CAL, M); Pegu Yomah, *Kurz 1806*, fr. May 1871 (CAL, K); Salween, fl. March 1880 (NY); Youngeleen, *Brandis*, fl. 1880 (CAL); Tenasserim, *Meebold 14464*, fl. March 1911 (CAL); Tenasserim, Wagan, *Meebold 15160*, fr. Apr. 1911 (CAL); Taking Valley 24°45′ NL., *Forrest 11823*, fl. Apr. 1913 (BM, E); Taking Valley 24°35′ NL., *Forrest 13601*, fl. Apr. 1917 (E); Myaungtaga, Insein Distr., *Parkinson 607*, fl. March 1925 (CAL, DD); Yapu-Kalunaung Res., Tavoy Distr., *Sein Syi 957*, fl. March 1925 (DD); Wa Zuu Chaung, Tavoy Distr., *Mg Me 927*, fl. March 1925 (CAL, DD); Theebyu, Theinkun Chaung, S. Tenasserim, *Parkinson 1924*, fl. Feb. 1926 (K); Arakan Yoma, Sandoway, *Ba Pe 12036*, fl. Feb. 1931 (DD, K); Rangoon, *Barnard DLP 1*, fl. 1931 (BM); ibidem, *Parkinson 14144*, fl. March 1932 (DD); ibidem, *Dickason 5836A*, fr. Feb. 1934 (A); ibidem, *Scott*, fl. March 1934 (DD); Myaukhlaing Res., Insein Distr., *Po K'Laut 106*, fl. Feb. 1948 (DD).

Siam: Payap: Chiengmai, Doi Sutep, *Kerr 1787*, fl. Apr. 1911 (BM, CAL, L, P). — Rachaburi: Wangka, Kanburi, *Kerr 10493*, fl. Feb. 1926 (BM); Neeckey near Wangka, *Kostermans 246*, fr. Apr.—May 1946 (BRI, L, SING).

Cultivated: Calcutta, *Pierre*, fl. 1863 (P).

var. kerrii (Craib) Hoogl. stat. nov.

Dillenia kerrii Craib 1911.

Carpels hirsute in upper part only or for whole surface.

Burma: Tenasserim, *Gallatly 799*, fl. Apr. 1877 (CAL); Upper Burma, Ruby Mines, *Abdul Huk 232*, fl. March 1892 (CAL); Sherwood, Maymyo Distr., *Mg Po Khaut 11438*, fl. Apr. 1930 (DD).

Siam: Payap: between Muang Prao & Chiengdao, *Kerr 1046*, fl. March 1910 (BM, K); Muang Fang, *Kerr 5235*, fr. Apr. 1921 (BM, K).

Of the following specimens the variety cannot be ascertained as no flowers or fruits are available:

Burma: (NY); Amherst, *Falconer*, Apr. 1849 (CAL, MEL); Youngeleen, March 1880 (NY).

Distribution. Burma and W. Siam.

Ecology. In dry, open forests. Flowering in the dry season, from February to May.

Vernacular names. Burma: *Linyaw, Lingyaw.* Siam: *Lawe* (Siamese, Korat), *Masan hing, Masan kweng* (Lao, Chiengmai), *Kwawng* (Karen, Wangka).

Uses. The wood is little used, mainly for beaming and similar purposes.

Notes. 1. The differences of *var. parviflora* and *var. kerrii* are found only in the hirsute indument of the carpels in the latter. The type of *var. kerrii* and *Gallatly 799* have only the apical part hirsute, in the other specimens the carpels are hirsute for the whole surface.

2. *Ba Pc 12036* differs from the other specimens by a longer pedicel (up to 6 cm) and more-flowered inflorescences (up to 7-flowered).

53. Dillenia andamanica Parkinson 1935

Dillenia pilosa Auct. non Roxb. ex Buch.-Ham.; Kurz, J. As. Soc. Beng. 41, II, 1872, p. 291; Kurz, J. As. Soc. Beng. 43, II, 1874, p. 46; Kurz, J. As. Soc. Beng. 45, II, 1876, p. 115; Kurz, For. Fl. Br. Burma 1, 1877, p. 20; Parkinson, For. Fl. Andaman Isls, 1923, p. 71.

Dillenia andamanica *Parkinson, Ind. Forester 61, 1935, p. 452, pl. 29.

Dillenia nicobarica Kurz ex Parkinson, Ind. Forester 61, 1935, p. 449, nomen nudum.

Type specimen: Parkinson 1185, Bomlungta, Middle Andaman, 12 Apr. 1916; holotype in K, isotype in CAL.

Deciduous trees, up to 30 m high, 90 cm thick, with up to ca 15 m bole. Bark thin, smooth, greyish. Wood greyish. Branches not typically sympodial, younger ones ca 2—3 mm thick, rather densely shortly hirsute, glabrescent. Leaf-scars clasping about $^3/_5$ of branch, subfalcate with ca 13—17 leaf-traces slightly above middle. *Leaves* obovate to narrowly so, 22—45 × 11—17 cm, with 40—50 nerves on either side, on saplings and young trees narrower, up to 60 × 17 cm, up to 60-nerved; rounded to obtuse at apex, acute at base, decurrent; margin dentate, mainly in upper part, to nearly entire, nerves rather straight, slightly curving upward near margin, ending in apex of teeth; sparsely shortly hirsute, soon glabrescent above, shortly strigose-hirsute on midrib and nerves, on intervenium mainly on transverse venation, more or less glabrescent beneath. Petiole $^1/_2$—2 cm, glabrous above, densely shortly sericeously hirsute beneath, with up to $1^1/_2$ mm broad, non-amplexicaul wings. *Flowers* appearing before leaves, solitary, sometimes 2 together, on up to 3 mm long short shoots, rarely a second serially arranged ca 2 mm above the first, in axil of leaf-scars on 2—6 mm thick branches; short shoots with bracts; bracts caducous, sessile, ovate to lanceolate, 10—25 × 5—7 mm, glabrous above, densely shortly hirsute beneath. *Flowers* ca 12 cm across. Pedicel 1—$3^1/_2$ cm, ca $1^1/_2$—2 mm thick, more or less densely strigose-hirsute, glabrescent, without bracteoles. Sepals 5, 2 outermost ones smaller, ca 15 × 12 mm, than 3 innermost ones, ca 18 × 14 mm, glabrous inside, densely shortly sericeous except in bud covered margins which are glabrous for ca 3 mm outside, all densely ciliate at margin. Petals 5, yellow, obovate, 5—$5^1/_2$ × 3—$3^1/_2$ cm, rounded at apex, narrowed towards base. Stamens in 2 distinct groups, those of outer group (ca 100) slightly curved in bud, ca 7 mm long, those of inner group (ca 30) with apical part reflexed outward in bud, ca 13 mm long; filament of stamens of outer group $2^1/_2$—3 mm long, ca 0.3 mm broad, of those of inner group ca 8 mm long, ca 0.4 mm broad; anther ca 0.6—0.8 mm broad, obtuse at apex; thecae linear, opening with pore near apex on inner side. Carpels (6—)8, arranged around narrow conical receptacle, lanceolate, ca 5 × $1^1/_2$ mm, glabrous, each with ca 15—20 ovules; styles recurved, ca 10 mm long, slightly flattened, ca 1 mm broad, channelled above. *Pseudocarps* indehiscent, orange, about globular, ca $2^{1}/_{2}$ cm diam. including enclosing sepals; seeds unknown.

Andaman Islands: S. Andaman, *Kurz* (CAL, K, P); Aberdeen, S. Andaman, *Kurz*, fl. (CAL); Middle Andaman, Middle Straits, *Kurz* (CAL); S. Andaman, *King*, fl. Apr. 1890 (BM, BZ, CAL, DD, E, G, GH, K, L, P); ibidem, *Heinig 105*, Aug. 1896 (CAL); *Prain's Coll.*, fl. & fr. Apr. 1899 (CAL, G, K); *Prain's Coll. 27*, fl. (CAL); Bomlungta, Middle Andaman, *Parkinson 581*, fl. May 1915 (CAL, DD, K); ibidem, *Parkinson 1185*, fl. Apr. 1916 (CAL, K); Porlob Isl. (Middle Andaman), *Kirat Ram 3789*, fl. Feb.—March 1934 (DD).

Nicobar Islands: Little Nicobar, *Kamphövener 2866* (C); Kamorta, *Kurz*, Feb. 1875 (BZ, CAL, K); Ganges Harbour, Great Nicobar, *Rogers*, fl. Apr. 1903 (CAL).

Distribution. Andaman and Nicobar Islands.

Ecology. Very common in the deciduous forests in these islands. Leafless when flowering, about March — May, in the hot season.

Uses. Useful for house-building?

54. Dillenia aurea Sm. 1806

Dillenia aurea **Sm., Exot. Bot. 2, 1806, p. 65, t. 92, 93; DC., Syst. 1, 1818, p. 436; DC., Prod. 1, 1824, p. 76; Buch.-Ham., Trans. Linn. Soc. Lond. 15, 1826, p. 101; Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 70, p.p.; Hook.f. & Thoms., Fl. Br. Ind. 1, 1872, p. 37, p.p.; Brand., For. Fl. NW. & C. Ind., 1874, p. 2; Watt, Dict. Econ. Prod. Ind. 3, 1890, p. 112; Brand., Ind. Forester 26, 1900, p. 431; Gamble, Man. Ind. Timb. 2nd ed., 1902, p. 5; Prain, Beng. Pl., 1903, p. 196; Duthie, Fl. Upp. Gang. Pl., 1903, p. 21; Brand., Ind. Trees, 1906, p. 4, p.p.; Haines, Bot. Bihar & Orissa 2, 1921, p. 7; *Parkinson, Ind. Forester 61, 1935, p. 450, pl. 28 f. 2; Burk., Dict. Econ. Prod. Mal. Pen. 1, 1935, p. 809, p.p..

Dillenia pulcherrima Kurz, J. As. Soc. Beng. 40, II, 1871, p. 46; Kurz, J. As. Soc. Beng. 43, II, 1874, p. 46; Kurz, For. Fl. Br. Burma 1, 1877, p. 19; Watt, Dict. Econ. Prod. Ind. 3, 1890, p. 112; Gamble, Man. Ind. Timb. 2nd ed., 1902, p. 5; Brand., Ind. Trees, 1906, p. 4; Craib, Fl. Siam. En. 1, 1925, p. 24.

Dillenia indica var. aurea (Sm.) O. K., Rev. Gen. Pl. 1, 1891, p. 4, quoad comb..

Type specimens: *Dillenia aurea:* is wholly based on the plate published. — *Dillenia pulcherrima:* Dr Brandis, Burma; not seen by me.

Deciduous trees, up to 14 m high, 120 cm thick, with usually low and crooked, up to $3^{1}/_{2}$ m high bole. Bark reddish; heartwood reddish brown or grey. Branches not typically sympodial, younger ones 3—4 mm thick, slightly to densely hirsute, glabrescent. Leaf-scars clasping about $^{1}/_{2}$—$^{3}/_{5}$ of branch, subfalcate with 11—17 leaf-traces slightly above middle. *Leaves* elliptic-oblong, (15—)20—35(—50) × (7—)10—20(—30) cm, with (20—)25—35(—50) nerves on either side, on young plants and saplings generally longer and relatively narrower; rounded to truncate-emarginate at apex, truncate to (only in young leaves) acute, often asymetric at base, slightly decurrent when base truncate, strongly so when base acute; margin entire to very slightly undulate-dentate, nerves rather straight, ending in apex of teeth or otherwise in margin, often with small tuft of hairs at apex; sparsely hirsute, soon glabrescent above, sparsely hirsute, glabrescent on intervenium, strigose-hirsute on nerves and midrib beneath. Petiole 3—$6^{1}/_{2}$ cm, glabrous above, rather densely strigose-hirsute beneath. *Flowers* solitary, rarely 2 together at few mm distance on same branch, terminal, near base of pedicel with number of bracts and usually number of leaves under flower on branch in axil of one of bracts; bracts lanceolate, 15—30 × 6—10 mm, obtuse at apex, attached with broad base, densely sericeously hirsute on both sides; flowering slightly before and with appearance of leaves. *Flowers* 10—12 cm across. Pedicel ($1^1/_2$—)5—12 cm, 2—4 mm thick, thickened to 4—5 mm at apex, densely hirsute, without or often with 1—2 bracteoles; bracteoles like bracts at base. Sepals 5, oval, 2 outermost ones slightly smaller (ca 25 × 18 mm) than 3 innermost ones (ca 30 × 20 mm), 2 outermost ones shortly hirsute in up to 7 mm broad apical part, further glabrous, 3 innermost ones wholly glabrous inside, hirsute except in bud covered margins which are glabrous for breadth of up to 5 mm outside, densely ciliate at margin. Petals 5, yellow, obovate, $4^1/_2$—$5^1/_2$ × $3^1/_2$—$4^1/_2$ cm, rounded at apex, narrowed towards base. Stamens in 2 distinct groups, those of outer group (ca 150) slightly curved in bud, 10—$11^1/_2$ mm long, those of inner group (ca 50) with apical part reflexed outward in bud, 16—21 mm long, outside outer stamens sometimes some staminodes, 5—10 mm long; filament of stamens of outer group 3—$4^1/_2$ mm long, ca 0.5 mm broad, of those of inner group 9—11 mm long, ca 1.2 mm broad; anther 0.7 mm broad in stamens of outer group, 0.9 mm in those of inner group, sharply emarginate at apex; thecae linear, opening with pore near apex, in stamens of outer group on inner side, in those of inner group on outer side. Carpels 10—12, arranged around rather narrow conical receptacle, lanceolate, ca $8^1/_2$ × 2 mm, glabrous or densely hirsute with ca 1 mm long, rather rigid hairs, each with ca 19—22 ovules; styles spreading, ca 19 mm long, slightly flattened, ca 0.8 mm broad, channelled above. *Pseudocarps* indehiscent, orange-yellow, about globular, 30—35 mm diam. including enclosing sepals which are up to 40 × 30 mm; carpels ca 21 × 8 mm, 1- to few-seeded. Seeds obovoid, ca 4 × 3 mm, glossy dark brown, exarillate.

var. aurea

Dillenia aurea Sm. 1806. — *? Dillenia pulcherrima* Kurz 1871. — *Dillenia indica var. aurea* (Sm.) O. K. 1891.

Carpels glabrous.

India: NW. India, *Stewart,* fl. 1871 (E). — United Provs: Daibhar, Gorakhpur Distr., *Harsukh 21380,* fl. Apr. 1898 (DD, K); Barhantar Nala, Nepal Frontier Distr., *Inayat 23550,* fr. May 1900 (CAL, DD); Chauk, Gorakhpur Distr., *Shri Ram 10,* fl. & fr. May 1916 (DD); Bhamar, Gonda Divis., *Sus Ram 18,* fl. & fr. May 1916 (DD). — Centr. Provs: S. Mandla Divis., *Nat. Ranger 8275,* fl. May 1914 (DD). — Behar & Orissa: Manbhum, *Campbell,* fl. & fr. May 1886 (CAL); ibidem, *Campbell 8782,* fr. 1886 (DD); Singhbhum, *Haines 21,* fl. Apr. 1903 (BZ, CAL, DD, E, MEL, SING); near Hazaribagh, *Haines 21a,* fl. June 1905 (K); Madalgari hill, Musnea bungalow, Sonthal Parganas, *Haslett 7/1585,* fr. Apr. 1907 (DD).

Burma: Pegu, Tonkyeghat, *Kurz 40,* fl. (CAL, M); Pegu Yomah, Taung Kao, E. slopes, *Kurz 1807,* fl. & fr. (BZ, CAL, K, M); Pyinmane, *Ny Pya 1,* fl. (K); Shan Hills, Terai, *Collett 593,* fl. (K); Maymyo Hill, Upper Burma, *Badal Khan 53,* fl. June 1888 (CAL); near Shiltaung, *Prazer 388,* fr. Oct. 1890 (CAL); Shan Hills, Upper Burma, *Abdul Huk 86,* fl. 1892 (CAL, DD, P); Myitkyina, Kachin Hills, *Pottinger,* fl. March 1897 (CAL); ibidem, *Shaik Mokim,* fr. 1897 (CAL); ibidem, *Shaik Mokim,* fl. March 1898 (A, BM, BZ, CAL, CGE, FI, G, K, L, M, MEL, P, UPS); Kachin Hills, Metkina, *Shaik Mokim 19,* fr. June 1899 (A, CAL); Kachin Hills, Ciduoch, *Shaik Mokim 104,* fr. June 1899 (CAL); Thaton Distr., W. side Dawna Hills, *Lace,* fl. Feb. 1909 (E); Myitkyina Distr., Koekin Pidaung Plain, *Buchanan 66B,* fl. May 1909 (E); Myitkyina Distr., *Buchanan,* fl. (E); Ani Sakan, near Maymyo Plateau, *Lace 6193,* fr. May 1913 (DD, E, K); near Taukte, Tharawaddy Distr., *Rogers 291,* fl. & fr. Apr. 1914 (CAL, DD, E); Magwe Distr., Natmauk-Kyagan road, *Rogers 963,* fl. March 1915 (CAL, DD); N. Tanggoo Divis., *Rodger 2,* fr. Apr. 1915 (DD); Myinmann, *Basat,* fl. May 1916 (DD); *Burma For. School Ser. 16,* fl. Apr. 1919 (IFI);

idem 35, fl. Apr. 1919 (L); *idem 41,* fl. May 1919 (IFI); Insein, Myaukhlaing Res., *Po Khaut 11,* fr. Feb. 1948 (DD).

var. trichocarpella Hoogl. var. nov.

Type specimen: Lace, Maymyo Plateau, May 1912; holotype in E.

Descriptio typi: Differt a *Dillenia aurea* Sm. *var. aurea* carpellis hirsutis.

Carpels densely hirsute outside, with ca 1 mm long rather rigid hairs.

Burma: Maymyo Plateau, *Lace,* fr. May 1912 (E).

Of the following specimens the variety can not be ascertained as no flowers or fruits are available:

India: Centr. Provs: *Donald* (DD). — Behar & Orissa: Kumandi Res., Palaumau, *Gamble 8785,* Dec. 1880 (K); Singhbhum, *Haines 21,* Dec. 1902 (CAL); near Barwadih, Palamau, *Haines 21a,* Dec. 1906 (K).

Burma: Pegu Yomah, *Kurz 40* (CAL); Myitkyina, Mogaung Range, *Maung Mya 2813,* March 1926 (DD).

Siam: Payap: Meh Trang, *Kerr 1063,* March 1910 (BM, CAL, K, P).

Distribution. India (not in the Deccan Peninsula, Bengal, and Assam), Burma, NE. Siam; *var. trichocarpella* as yet known only from Burma.

Ecology. In the Sal (*Shorea robusta*) forests in the Indian part of the area, in the dry Dipterocarp (In or Indaing) forests of Lower Burma associated with *Dipterocarpus tuberculatus, Shorea obtusa,* and *Pentacme suavis* (Parkinson, 1935). Flowering in the dry season, from February to June.

Vernacular names. India (fide Haines, 1921): *Korkotta* (K., S.), *Aghai* (Th.), *Keringila, Karmata* (Gond.), *Rai* (Orissa); (fide Brandis, 1874): *Chamaggai* (Oudh), *Dheugr* (Nepal). Burma: *Byu, Byuben, Linyaw.* Siam: *Ma san juang, Masan hing.*

Notes. 1. *D. indica var. aurea* (Sm.) O. K. is nomenclaturally based on *D. aurea* Sm., though Kuntze when making this new combination had a specimen of *D. ovata* (from cultivation in the Botanic Garden at Bogor).

2. The original description is based wholly on the plate published. The character of the shape of the leaf, which is the most reliable distinctive character for the species against the closely related *D. obovata,* is not well given in the figure. As only the present species occurs where the drawing was made (E of the Gogra Riv., United Provs) Parkinson (1935 l. c.) retained *D. aurea* for the present species; I have followed him as the geographical argument seems reliable. It is assumed that the type had glabrous carpels, as the variety with hirsute carpels is not (yet?) known from India.

55. Dillenia obovata (Bl. 1825) Hoogl. 1951.

Colbertia obovata Bl., Bijdr. 1, 1825, p. 6; Hassk., Pl. Jav. Rar., 1848, p. 175.

Wormia obovata (Bl.) Spreng., Syst. 4, Cur. Post., 1827, p. 213.

Dillenia ornata **Wall., Pl. As. Rar. 1, 1830, p. 21, t. 23; *Parkinson, Ind. Forester 61, 1935, p. 451, pl. 28, f. 1.

Dillenia aurea Auct. non Sm.; Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 70, p.p.; de Vriese, Pl. Ind. Bat. Or., 1856, p. 80; Miq., Fl. Ind. Bat. 1, 2, 1859, p. 12; Miq., Ann. Mus. Bot. Lugd. Bat. 4, 1868, p. 80; Hook.f. & Thoms., Fl. Br. Ind. 1, 1872, p. 37, p.p.; Kurz, J. As. Soc. Beng. 43, II, 1874, p. 46; Kurz, For. Fl. Br. Burma 1, 1877, p. 20; *Pierre, Fl. For. Cochinch. 1, 1879, pl. 11—13; Laness., Pl. Util. Col. Fr., 1886, p. 282; King, J. As. Soc. Beng. 58, II, 1889, p. 367; Koord. & Val., Bijdr.

1. Booms. Java, 1894, p. 165; Fin. & Gagnep., Bull. Soc. Bot. Fr. Mém. 4, 1906, p. 9; Brand., Ind. Trees, 1906, p. 4, p.p.; Fin. & Gagnep., Fl. Gén. Ind.-Ch. 1, 1907, p. 21; Back., Fl. Batavia 1, 1907, p. 385; Back., Schoolfl. Java, 1911, p. 11; Koord., Exk. Fl. Java 2, 1912, p. 601; *Koord. & Val., Atl. Baumarten Java 1, 1913, f. 1; Ridl., Fl. Mal. Pen. 1, 1922, p. 11; Craib, Fl. Siam. En. 1, 1925, p. 21; Burk., Dict. Econ. Prod. Mal. Pen., 1935, p. 809, p.p.; *Corn., Wayside Trees Malaya, 1940, p. 201, pl. 50, 51; Back., Bekn. Fl. Java (em. ed.) 4, 1942, fam. 80, p. 5; Heyne, Nutt. Pl. Indon., 1950, p. 1071.

Dillenia aurea var. blumei *Pierre, Fl. For. Cochinch. 1, 1879, pl. 12.

Dillenia aurea var. kurzii *Pierre, Fl. For. Cochinch. 1, 1879, pl. 13.

Dillenia aurea var. harmandii *Pierre, Fl. For. Cochinch. 1, 1879, pl. 11.

Dillenia harmandii Gagnep., Not. Syst. 6, 1937, p. 39; *Gagnep., Suppl. Fl. Gén. Ind.-Ch. 1, 1938, p. 22, f. 4.

Dillenia obovata (Bl.) *Hoogl., Fl. Mal. I, 4, 1951, p. 173, f. 13.

Type specimens: *Colbertia obovata:* Blume 1519, Java; lectoholotype in L. — *Dillenia ornata:* Wallich 947, Amherst, Martabania; lectoholotype in K. — *Dillenia aurea var. blumei:* Pierre 771, Mnt Knang Repoeu, Tpong Prov., Cambodia, May 1870; lectoholotype in P, isotypes in BZ, K. — *Dillenia aurea var. kurzii:* Pierre 770, Knang Repoeu Mnts, Cambodia, June 1870; lectoholotype in P, isotype in K. — *Dillenia aurea var. harmandii & Dillenia harmandii:* Harmand 1321, Bassin d'Attopeu, Laos, Indo-China, 1875—7; holotype in P.

Deciduous trees, up to 35 m high, 70 cm thick, with up to 14 m, usually much shorter, often rather crooked bole, without or with small buttresses, with more or less deep longitudinal grooves in basal part; crown very dense, irregular or ovate. Bark yellowish to reddish grey, up to 15 mm thick, rather smooth, flaky; sapwood light yellow, heartwood light red or red. Branches not typically sympodial, younger ones glabrous, smooth, 3—8 mm thick, older ones with fine longitudinal fissures. Leaf-scars clasping about $^1/_2$—$^3/_5$ of branch, subfalcate with 11—21 leaf-traces about or slightly above middle. *Leaves* obovate, (16—)20—40(—60) × (10—)12—20(—26) cm, with (22—)30—45(—60) nerves on either side, on saplings and young trees narrowly obovate, 14—45 × 7—18 cm, 35—50-nerved; rounded, on saplings and young plants acute, at apex, acute at base, long-decurrent; margin slightly dentate to nearly entire, more conspicuously dentate on saplings and young trees, nerves rather straight, ending in apex of teeth, often with small tuft of hairs, often secondary nerve directed downward near margin, ending in apex of smaller teeth; dark green, in young leaves often more or less purplish, hirsute when young, later on glabrescent and then only hirsute on midrib above, dull with waxy coating, slightly hirsute on intervenium, strigose-hirsute on nerves beneath, rarely rather densely shortly villose on both sides. Petiole 1.3—4 cm, glabrous above, strigose-hirsute beneath, margin in basal part ciliate. *Flowers* solitary, rarely 2 or 3 together at apex of short side-branches, near base of pedicel with number of bracts; bracts lanceolate, 20—40 × 6—8 mm, attached with broad base, acute at apex, sericeously hirsute beneath and in apical part above, glabrous in basal part above; rarely leaf-bud in axil of one of bracts; flowering slightly before and with appearance of leaves. *Flowers* ca 14—16 cm across. Pedicel (15—)25—40(—50) mm, 4—6 mm thick, thickened to 7—9 mm at apex, more or less purplishly tinged, slightly hirsute, without or with whorl of 3 bracteoles at about $^2/_3$ of its height; bracteoles like bracts at base of pedicel. Sepals 5, oval, ca 30—38 × 20—30 mm, 2 outermost ones rather densely hirsute in apical part, up to 10 mm broad in centre, further glabrous, 3 innermost ones wholly glabrous inside, slightly strigose-hirsute outside, densely ciliate at margin. Petals 5, bright yellow, obovate, ca 65—80 × 45—55 mm, rounded at apex, narrowed towards base. Stamens in 2 distinct groups, those of outer group (ca 200—240) yellow, slightly curved in bud, 12—13 mm long, those of inner group (ca 38—56) yellowish white, with apical part reflexed outward in bud, 22—24 mm long; outside outer stamens often some (up to 7) staminodes; filament of stamens of outer group $3^{1}/_{2}$—$5^{1}/_{2}$ mm long, 0.5—0.8 mm broad, of those of inner group 10—11 mm long, ca 1.5 mm broad; anther ca 1.2 mm broad in stamens of outer group, 1.5 mm in those of inner group, sharply emarginate at apex; thecae linear, opening with pore near apex, in stamens of outer group on inner side, in those of inner group on outer side. Carpels (6?—)9—11(—14)(—18?), arranged around conical receptacle, lanceolate, ca 13 × 2 mm, glabrous, each with ca 25—35 ovules; styles recurved, ca 20 mm long, flattened, up to 1.5 mm broad, 1 mm thick, channelled above. *Pseudocarps* indehiscent, yellow or orange, about globular, 35—40 mm diam. including enclosing sepals which are up to ca 50 × 40 mm, up to 6 mm thick at base; carpels ca 25 × 10 mm, 1- to few-seeded. Seeds reddish, brownish, or black, obovoid, ca 5 × $3^{1}/_{2}$ mm, glossy, exarillate, embedded in transparent slime.

Burma: Moulmein, *Wallich 947*, fl. Jan. 1827 (K); Amherst, *Wallich 1612*, fl. Feb. 1827 (CAL); Ataran, *Wallich 947*, fl. March 1827 (CAL, K); Amherst, *Wallich 947*, fl. 1827 (K); Moulmein, *Griffith 42*, fl. 1834 (CGE); Amherst, *Falconer*, Apr. 1849 (BZ, GH, K, M, MEL, P); Youngeleen, *Brandis 1214*, March 1862 (MEL); Amherst, *Pierre 3300*, fl. & fr. 1863—4 (P); Pegu, Plumadoe, Myitgnan Vall., *Kurz 40/b*, fl. (CAL); Pegu, Karenholes, *Kurz 1808*, Apr. 1871 (CAL); Moulmein, *Kurz*, fl. (CAL); Tenasserim, *Packman*, fl. (BM); Bithokho Range, Martaban Hills, *Brandis*, fl. March 1880 (CAL); Tavoy Distr., *Mokim 567*, fl. Apr. 1901 (CAL); W. side Dawna Hills, Thaton Distr., *Lace*, fl. Feb. 1909 (E); Kyauktalon, Tenasserim, *Meebold 14610*, fl. March 1911 (CAL); Pagaye, Tenasserim, *Meebold 15199*, fr. Apr. 1911 (CAL, S); Kaleinaung Res., Tavoy Distr., *Sein Gyi 957*, fr. March 1925 (CAL); ibidem, *Sein Gyi 958*, fl. March 1925 (CAL); Chaungnaukpyan, S. Tenasserim, *Parkinson 1604*, fl. Jan. 1926 (K); Maliwun, Victoria Point, S. Tenasserim, *Parkinson 2040*, fl. March 1926 (DD, K); *Parker 2668*, fl. Feb. 1927 (DD, UC).

Siam: Rachasima: Korat, *Witt*, fl. June 1903 (K). — Chantaburi: Klawny Magom, Kaw Chang, *Kerr 6929*, fr. Apr. 1923 (BM, K). — Rachaburi: Wangka, Kanburi, *Kerr 10499*, fl. Feb. 1926 (BM); Tripagodas, *Kostermans 374*, fr. May 1946 (L, SING). — Surat, Tapli, *Kloss 6731*, fl. (K); Huai Sai, Bandon, *Punyabukkana 861*, fl. March 1920 (CAL); Map Amarit, Chumpawn, *Kerr 11440*, fl. Jan. 1927 (BM). — Puket: Jongkah, *Curtis 2924*, fl. July 1893 (CAL, K, SING); Setul, *Ridley*, fl. March 1910 (SING); Kuan Po, Satul, *Kerr 13811*, fl. Jan. 1928 (BM); Adang, Sulut, *Kerr 14020*, fl. Jan. 1928 (BM); Nok Nang, Ranawng, *Kerr 16829*, fl. Jan. 1929 (BM); Tap-put, Pang-nga, *Kerr 19352*, fl. March 1930 (BM). — Nakawn Sritamarat: foot of Kao Keo hill, *E. G. Smith 479*, fl. (BM); Padang Besar, *Kerr 13625*, fl. Dec. 1927 (BM); Saba Zoi, Songkla, *Kerr 14798*, fl. March 1928 (BM). — Pattani: Jalor, *Gwyne-Vaughan 456*, fl. May 1899 (CAL, K, L, P); Ban Pari, Toh Mih, *Lakshnakara 650*, fl. Apr. 1931 (BM).

Indo-China: Laos: Plateau d'Attopeu, *Harmand 1321 (= Pierre 2043)*, fl. March 1877 (P). — Cambodia: Kuang Repoeu Mts, Tpong Prov., *Pierre 771*, fr. May 1870 (BZ, K, P); ibidem, *Pierre 770*, May 1870 (NY); foot of Pangebakh Mtn, *Pierre 769*, May 1870 (P); Aral & Ranconvu Mts, Samrongtong Prov., *Pierre 589*, fr. (K, P); Knang Repoeu Mts, Tpong Prov., *Pierre 770*, fr. June 1870 (K, P; hirsute form); ibidem, *Pierre 3257*, fl. June 1870 (P); ibidem, *Pierre 768*, fl. & fr. June 1870 (A, K, P; hirsute form); Phu Quoc, *Pierre*, Jan. 1877 (K); *Hahn* (P). — Cochinchina: *Gaudichaud*, 1839 (FI).

Sumatra: Palembang: Musi-Ulu, *Endert 13*, fl. Sept. 1917 (BZ); Lematang Ilir, near G. Megang, *NIFS T 3 P 830*, fr. Nov. 1922 & fl. Oct. 1923 (BZ); Lematang

Ilir, near Darmo, *NIFS bb 8333*, Apr. 1925 (BZ); Martapura, *Bol 4*, Feb. 1930 (BZ). — Lamp. Distr.: Telok Betong, Bukit Rangal, *Elbert*, fr. 1908 (L); Telok Betong, near Merah Batin, *NIFS bb 5922*, fl. & fr. Nov. 1923 (BZ, L); Telok Betong, Hadjimenah, *NIFS bb 7717*, Jan. 1925 (BZ, L); Tulang Bawang Ilir, near Manggala, *NIFS bb 8472*, July 1925 (BZ).

Malay Peninsula: Kedah: Bukit Pinang, Alor Sta, *Ridley 15182*, fl. July 1900 (BM, K, SING; all with leaves of *D. ovata* added); road from Kodiang to the Singgora road, *Corner*, July 1936 (SING). — Prov. Wellesley: Bukit Mertajam, *Ridley*, fl. June 1900 (SING); Tassih Glugor, *Curtis*, fl. Apr. 1902 (SING). — Kelantan: Kg Muhang near Kota Bahru, *Corner SF 33445*, fl. Apr. 1934 (SING); Kota Bahru, *Corner SF 33450*, fr. Apr. 1937 (SING). — Trengganu: Sungai Besut, *Corner SF 33500* (SING). — Pahang: Kuala Lipis, *Corner SF 33531*, fl. & fr. May 1937 (SING). — Langkawi Isls: Rawei Isl., *Ridley 15758*, fl. Apr. 1901 (BM, K, SING); Gunung Raya, Langkawi, *Corner*, Nov. 1941 (SING).

Java: fl. or veg. (BZ, K, L, MEL, P, S, U); *Blume* (L, U); *Blume 1519*, fl. (L); *Junghuhn*, fl. (BZ, L); *Lahaye*, fr. (G, P); *Schl.*, fr. (P); *de Vriese*, fl. (L). — W. Java: Gunung Tjisalak, *118* (L); near Tjikoja, *Zollinger 195*, fl. June 1842 (FI, G, K, L, P); Salak?, *Ploem*, fl. (BZ); Koeningan, Cheribon, *Houter 158*, March 1873 (BZ); Palabuan Ratu, *Boerlage*, fl. & fr. (L); Kampbaru, Kedunghalang, *Boerlage 158*, fr. Oct. 1888 (L); Palabuanratu, *Koorders 1631β*, May 1890 (BZ); ibidem, *Koorders 1623β*, May 1890 (BZ, K, L); ibidem, *Koorders*, fr. May 1890 (BZ); ibidem, *Koorders 1634β*. fl. & fr. June 1890 (A, BZ, K, L); ibidem, *Koorders 33102β*, March 1891 (BZ); ibidem, *Koorders 11735β*, fr. Aug. 1891 (BZ, P); Tjimara Udjongkulon, *Koorders 1624β*, June 1892 (BZ); Palabuanratu, *Koorders 14043β*, fl. & fr. Sept. 1894 (BZ, P); near Tjampea, *Koorders 30593β*, Aug. 1898 (BZ); near Depok, *Koorders 30956* , fr. Aug. 1898 (BZ); Kebajoran, along the pasangrahan, *Backer 32593*, March 1907 (BZ, K, L, SING); between Rangkas Bitung & Tjileles, Bantam, *Backer 1104*, fr. June 1911 (BZ); between Tjileles & Gunung Kentjana, *Backer 1197*, June 1911 (BZ); Pasir Ajunan near Sadjira, *Backer 1954*, fl. & fr. June 1911 (BZ); Gunungkantjana, Lebakkidul, Bantam, *Koorders 41138β*, fl. & fr. June 1912 (BZ, L); Depok, *Koorders 42226β*, Sept. 1913 (BZ); S of Djasinga, *Backer 10071*, fl. Nov. 1913 (BZ); N of Wanajasa, *Backer 14419*, June 1914 (BZ); between Tjibadak & Bodjong Lapang, Preanger, *Backer 16897*, fl. Nov. 1914 (BZ); Tjitjurug, Djampang Kulon, *Backer 17249*, fl. & fr. Nov. 1914 (BZ); Tjiratjap, Djampang Kulon, *Backer 17464*, fl. Nov. 1914 (BZ); Baleh Kambang, Preanger, *Backer 25613*, fr. Aug. 1918 (BZ); Wanajasa (SE of Purwakarta), *Bakhuizen v. d. Brink 4811*, fl. July 1920 (BZ); Tji Lodong E of Depok, *Backer 35170*, May 1922 (BZ); Depok, Tree no 6, fr. Nov. 1924 (WAG); Djampangkulon, near Tjilrangkung, Tjitjaringao, *NIFS Ja 1253*, May 1926 (BZ); Pasir Honje S of Leuwiliang, *Bakhuizen v. d. Brink 7378*, fl. Oct. 1928 (BZ); Tjisolok, Preanger, *Bruggeman & Hagen 987*, fl. Nov. 1931 (BZ); Gunung Aseupan, *van Steenis 8248*, fl. & fr. Sept. 1936 (BZ); Pandeglang near Singiang, *NIFS Ja 3962*, Apr. 1937 (BZ, L); W. Preanger, S. Coast near Tjikepuh, *Franck 133*, Apr. 1938 (BZ); between Tipar & G. Tjikepuh, *van Steenis 11460*, fl. July 1939 (BZ). — C. Java: Darma Temulus, Tegal, *Koorders 1612β*, Sept. 1891 (BZ); Margasari, Brebes, Tegal, *Koorders 1614β*, Sept. 1891 (BZ, K, L); Banjumas, Madjenang, *Backer 18820*, Jan. 1915 (BZ); Prupuk, Pekalongan, *Noltée 4038*, fl. & fr. Oct. 1919 (BZ, WAG); ibidem, *Boots 4038*, fr. Nov. 1922 (BZ); ibidem, *de Boer 4038b*, fr. Jan. 1924 (BZ). — Nusa Kambangan: *Koorders 1615 1616β, 1618β, 1619β*, Dec. 1891 (BZ); *Koorders 1617β*, Dec. 1891 (BZ, L); *Koorders 20251β*, fl. Nov. 1895 (BZ, L); *Koorders 24671β*, Sept. 1896 (BZ).

Borneo: *Korthals*, fl. (L, U).

Cultivated: Bot. Gard. Bogor: fl. or veg. (BZ, L, U); *Teysmann*, fl. (K); no IV-G-17, fr. (BZ, US); no IV-G-17a, fl. & fr. Nov. 1889 (BZ, CAL, K, L); no VII-B-51, *Boerlage* (BZ).

Without data: material in BZ, S.

Distribution. Lower Burma, Siam, Indo-China, northern part of the Malay Peninsula, S. Sumatra, and W. Java (E to Tegal and Nusa Kambangan); the Borneo record (*Korthals*) is not reliable.

Ecology. Mainly in belukar and secondary forest at low altitudes; in Siam and Burma also in dry deciduous forests up to ca 1300 m, in Indo-China up to 1800 m altitude. Flowering when leafless, in the northern part of its area (Burma, Siam, Indo-China, Malay Peninsula) from January to July, in the southern part (Sumatra and Java) from July to December.

Vernacular names. Burma: *Zinbyun* (Burmese), *Mai-san* (Shan). Siam: *Mai Sarn, San, San yai, San tong* (Peninsular Siam), *Kwawng padu* (Wangka). Indo-China: *Cay so ma.* Sumatra: *Simpur bener, S. rimba, S. talang.* Malay Peninsula: *Simpoh.* Java: *Sempu* (Javanese); *Sempur, S. batu* (Sundanese).

Uses. The fruit is eaten in curries. The wood is sometimes used in house-building.

Notes. 1. *Dillenia harmandii* Gagnep. is based on 2 specimens, the one being the lectotype (flowering material), the other a leaf-specimen representing *D. pentagyna.* The number of carpels of the type, said by Pierre to be 15—18, is in the flowers of the type collection I examined 10—14 and falls definitely within the variability of the species, though it is rather large.

2. The species is certainly closely related to the preceding one; the differences have been worked out by Parkinson (1935). Though the differences between the 2 species are found principally in the full-grown leaves. I have retained them as distinct species as the leaf-shape is very characteristic; additional differences in the flower are not of absolute value.

3. *D. aurea var. blumei* Pierre and *var. kurzii* Pierre were intended to reduce *Colbertia obovata* Bl. and *D. pulcherrima* Kurz as varieties to *D. aurea.* Besides Pierre cited some actual specimens. From the latter I have chosen the specimens to be considered as the type for these varieties, thus reducing both to *D. obovata*; if *D. pulcherrima* is considered to typify *D. aurea var. kurzii,* this variety must be reduced to *D. aurea.*

DOUBTFUL SPECIES

Dillenia repanda Roxb., Fl. Ind. ed. Carey 2, 1832, p. 652.

This species, described from the Deccan Peninsula (Hindoostan) is imperfectly known as no type specimen seems to exist and the description is insufficient. From the species known from the Deccan Peninsula it comes nearest to *D. bracteata,* and it may be identic with it (cf. p. 85).

Dillenia grandifolia Wall. ex Hook.f. & Thoms. 1855.

Dillenia grandifolia Wall., Cat., 1828, no 946, nomen nudum; Hook.f. & Thoms., Fl. Ind. 1, 1855, p. 71; Miq., Fl. Ind. Bat. 1, 2, 1859, p. 12; Hook.f. & Thoms., Fl. Br. Ind. 1, 1872, p. 38; King, J. As. Soc. Beng. 58, II, 1889, p. 368; Ridl., J. Str. Br. R. A. S. 59, 1911, p. 61; Ridl., Fl. Mal. Pen. 1, 1922, p. 11; Craib, Fl. Siam. En. 1, 1925, p. 22; Corn., Wayside Trees Malaya, 1940, p. 203.

Type specimen: Wallich 946, Convalescent Hill, Penang, August 1822; holotype in K, isotypes in CAL, CGE, P.

The species is based on leaves only, which were taken from a sapling or young tree and may belong either to *D. ovata* or to *D. reticulata.* In the latter case this species will have to be renamed *D. grandifolia* Wall. ex Hook.f. & Thoms.. A similar specimen is *Griffith 52* from Malacca (K). The identity of the species can only be ascertained by comparison with specimens of which the identity by means of additional characters (flowers, normal leaves) is certain. Most of the later literature refers to specimens of *D. reticulata.*

Dillenia rhizophora Boerl. & Koord. in Koord.-Schum., Syst. Verz. 2, 1911, p. 36.

Type specimen: Koorders 10289β, Middle Sumatra, Banks of the Sigati Riv., 12 March 1891; holotype in BZ.

This species is based on some leaves only, belonging either to *D. eximia* or to *D. reticulata*; cf. p. 80.

The following specimens are insufficient for identification, but may represent new species:

1. *Haenke, Reliquiae Haenkeanae N 128,* Taragalac, Luzon, 1792 (UC). Leaves narrowly obovate, 8—16 × 3.2—6 cm, 8—11-nerved, obtuse at apex, acute at base, distinctly dentate at margin, glabrous. Petiole 2—3 cm, with amplexicaul wings; wings narrowly lanceolate, up to 3 mm broad.
2. *M. Oro FB 22873,* Samar, fr. Aug. 1914 (UC, US). Leaves oblong, ca 12 × 6 cm, 10—14-nerved; acute at apex and base; slightly undulate at margin, nerves curving upward, ending in margin; glabrous. Petiole 2—3 cm, with amplexicaul wings; wings caducous, not present in the specimens. Fruit in the UC specimen solitary on 25 mm long pedicel; sepals ca 25 × 15 mm, sparsely hirsute outside; petals and stamens unknown; carpels 5—7, ca 20 mm long, 16 mm broad, with ca 10—12 (?) ovules, with basal aril; seeds unknown. In the US specimen 2-flowered inflorescence with very short axis. The US specimen bears the name *Dillenia samarensis* n. sp., without author.
3. *M. Ramos BS 24195,* Catubig Riv., Samar, Feb.—March 1916 (US). Leaves oblong, 12—23 × 3.5—8 cm, acute at apex, distinctly dentate at margin, nerves on young leaf very sparsely hirsute beneath, on full-grown leaf glabrous; nerves curving upward, ending in apex of teeth. Petiole 2—3.5 cm, with amplexicaul wings; wings caducous, narrowly lanceolate. Probably leaves from a sapling of the same species as no 2.
4. *Sir W. McGregor,* Lowlands of British New Guinea, fr. 1890 (MEL). The specimen consists of an incomplete leaf (petiole partly absent, probably with caducous, amplexicaul wings), an older branch (without leaf-scars, with bark peeling off in papery flakes), and 2 immature fruits. The young fruits are like those of *D. papuana,* but differ from that species by the dense shortly sericeous indument on the outer side of the sepals. The number of carpels is 10, the stamens are probably all of about the same length. The specimen may represent a new species or be only a variety of *D. papuana,* or it may by identic with *D. pteropoda,* until now known only from the Philippines and the Moluccas. The material is definitely insufficient for identification.

EXCLUDED SPECIES

Dillenia scandens Willd., Sp. Pl. 2, 1799, p. 1251; = *Hibbertia scandens* (Willd.) Dryand. in Kon. & Sims, Ann. Bot. 2, 1807, p. 525, basonym; cultivated and Australia.

Dillenia integra Auct. non Thunb.; Moench, Meth. Suppl., 1802, p. 76; = *Hibbertia scandens* (Willd.) Dryand.; cultivated.

Dillenia volubilis (Andr.) *Vent., Choix d. Pl., 1803, p. 11 (*Hibbertia volubilis* **Andr., Bot. Repos. 2, 1800, t. 126); = *Hibbertia scandens* (Willd.) Dryand.; cultivated.

Dillenia turneraeflora Ker-Gawl., Recens. Pl. Bot. Repos., 1801, p. 27 (based on *Hibbertia volubilis* **Andr., Bot. Repos. 2, 1800, t. 126); = *Hibbertia scandens* (Willd.) Dryand.; cultivated.

Dillenia procumbens *Labill., Nov. Holl. Pl. 2, 1806, p. 16, t. 156; = *Hibbertia procumbens* (Labill.) DC., Syst. 1, 1818, p. 427; Australia.

Dillenia grossulariaefolia (Salisb.) Poir., Encycl. Suppl. 5, 1817, p. 146; = *Hibbertia grossulariaefolia* **Salisb., Parad. Lond. 2, 1807, t. 73; cultivated.

Dillenia speciosa Auct. non Thunb.; **Bot. Mag. 13, 1799, t. 499; *Mag. Bot. & Gard. 4, 1836, t. 56; = *Hibbertia scandens* (Willd.) Dryand.; cultivated.

Dillenia andreana F. v. M., Fragm. 5, 1866, p. 175; = *Saurauia andreana* (F. v. M.) Oliver ex F. v. M., Census Suppl. 2, 1885, p. 3; F. M. Bail., Queensl. Fl. 1, 1899, p. 106; Australia.

INVALIDLY PUBLISHED NAMES

The following names, most of which are included in the Index Kewensis, are not validly published according to the International Rules of Botanical Nomenclature; some other names have been cited already in the synonymy.

Dillenia humilis Donn, Cat. Hort. Cant. ed. 1, 1796, p. 64, nomen nudum.

Dillenia tetragyna Lag. ex DC., Syst. 1, 1818, p. 429, in syn. sub *Hibbertia diffusa* R. Br. ex DC..

Clugnia Comm. ex DC., Syst. 1, 1818, p. 433, in syn. sub *Wormia madagascariensis* (Poir.) DC..

Clugnia volupis Comm. ex DC., Syst. 1, 1818, p. 433, in syn. sub *Wormia madagascariensis* (Poir.) DC..

Clugnia volubilis Comm. ex Steud., Nom. ed. 1, 1821, p. 208, sphalm. for the preceding.

Dillenia radicans Hort. ex Link, Enum. Hort. Berol. 2, 1822, p. 86, nomen nudum.

Dillenia macrophylla Reinw. ex Blume, Cat. Gew. Btzg, 1823, p. 78, nomen nudum. In the Leyden herbarium a specimen is present under this name, consisting only of a number of petals, probably belonging to *D. indica*.

Dillenia aquatica Moon, Cat. Ind. Exot. Pl. Ceylon, 1824, p. 42, nomen nudum; = *D. indica*.

Dillenia racemosa Buch.-Ham. ex D. Don, Prod. Fl. Nep., 1825, p. 225, in syn. sub *Ternstroemia racemosa* D. Don.

Dillenia macrocarpa Ruiz ex Vesque in DC., Monog. Phan. 8, 1893, p. 62, in syn. sub *Clusia pavoni* Planch. & Triana.

Dillenia magnicapsula Pav. ex Vesque in DC., Monog. Phan. 8, 1893, p. 62, in syn. sub *Clusa pavoni* Planch. & Triana.

Dillenia rubescens Ruiz ex Vesque in DC., Monog. Phan. 8, 1893, p. 63, in syn. sub *Clusia elliptica* H. B. K..

Dillenia thurifera Pav. ex Vesque in DC., Monog. Phan. 8, 1893, p. 59, in syn. sub *Clusia thurifera* Planch. & Triana.

Index to collectors' numbers

The number in *italics* refers to the number of the species in the present revision (cf. list on p. 8—10); varieties and other infraspecific groups are indicated with *a*, *b*, etc. as follows: *8a: D. ovalifolia var. ovalifolia, 8b: var. sericea; 27a: D. philippinensis var. philippinensis, 27b: var. pubifolia; 33a: D. reticulata var. reticulata, 33b: var. psilocarpella, 33c: D. reticulata* or *D. eximia; 38a: D. excelsa var. excelsa, 38b: var. pubescens, 38c: var. tomentella, 38d: var. excelsa* or *var. pubescens; 52a: D. parviflora var. parviflora, 52b: var. kerrii, 52o: var. parviflora* or *var. kerrii; 54a: D. aurea var. aurea, 54b: var. trichocarpella, 54c: var. aurea* or *var. trichocarpella.*

Abdoel Rachid 1894: *38a*; Abdul Huk 86: *54a*; 232: *52b*; Abu CF 4904: *32*; Achmad 1076: *41*; 1441; *38a*; Aet 327: *21*; 344: *21;* Aet & Idjan 336: *21*; 804: *13*; Agama 434: *38a*; Ahern s. n.: *27b*; 54: *27a*; 78: *27a*; 308: *27a*; 781: *27a*; Ahern's Collector 101: *27a*; FB 2973: *27a*; Ahmad CF 3898: *41*; 5024: *33b*; 5194: *41*; d'Albertis s. n.: *21*; Alcacid PNH 6016: *44*; Alfiah TB 466: *32*; Ali CF 23679: *41*; d'Alleizette s. n.: *18, 37*; 40: *7*; Alvarez FB 22169: *27a*; Alvins s. n.: *30, 48*; 161: *41*; 353: *38b*; 656: *48*; 676: *41*; 1783: *30*; Amand s. n.: *30*; Amdjah 23: *38a*; 529: *47*; 917: *30*; 1017: *30*; van Andel s. n.: *4*; Anderson s. n.: *38b, 43, 48, 50*; 1: *38a*; 2: *30*; Anonymus 118: *55*; 155: *47*; 863: *49*; 976.5: *19*; 2837 HB: *50*; 5324 HB: *25*; 5339 HB: *25*; 5847 HB: *25*; CF 939: *48*; M 9: *50*; NGF 2771: *20*; NGF 3286: *13*; see also NIFS; Anta s. n.: *46*; 185: *19*; Anthony BNB A 788: *30*; Armit 13: *19*; Arsat BNB 1052: *38a*; 1260: *38a*; Asdat 203: *38b*; Austin BNB A 1182: *30.*

Ba Pe 12036: *52a*; Backer s. n.: *30*; 1104: *55*; 1197: *55*; 1954: *55*; 2214: *38d*; 9903: *30*; 10056: *30*; 10071: *55*; 10333: *38a*; 14419: *55*; 16897: *55*; 16956: *38a*; 17249: *55*; 17464: *55*; 17597: *50*; 18548: *38a*; 18572: *38a*; 18722: *38a*; 18820: *55*; 23168: *30*; 25613: *55*; 26022: *30, 38a*; 26285: *30*; 27160: *50*; 32593: *55*; 35170: *55*; 35307: *46*; 35308: *46*; Badal Khan 53: *54a*; 421: *50*; Baker s. n.: *38c*; 286: *17*; 2002: *7*; 5570: *41*; 5843: *41*; Bakhuizen v. d. Brink 4811: *55*; 5065: *47*; 7378: *55*; 7830: *30*; 8203: *13*; Bakhuizen v. d. Brink Jr 659: *47*; 890: *30*; 1568: *30*; 2042: *47*; Bal 50: *38d*; Balajadia BNB 2561: *30*; 3722: *38a*; Balansa 3380: *47*; 3381: *47*; Banks & Solander s. n.: *19*; Barber 7730: *50;* Barnard CF 29057: *41*; DD 15: *47*; DLP 1: *52a*; DP 16: *47*; Baron 1596: *7*; 2625: *7*; 5958: *7*; Bartlett 8718: *38a*; 15541: *44*; Bartolomé 69: *27a*; Basat s. n.: *54a*; Bateson 14: *21*; Batten Pooll s. n.: *47*; Beccari s. n.: *4, 8a, 13, 25, 30, 33b, 38a, 43, 48*; PB 134: *1*; 175: *30*; 192: *30*; 497: *1*; 514: *48*; 1193: *38c*; 1271: *38c*; 2554: *32*; 2556: *38a*; 2828: *47*; 3076: *1*; 3177: *48*; 3940: *38a*; 4064: *34*; 4065: *48*; 4067: *30*; PP s. n.: *21*; 341: *20*; 647: *13*; PS 548: *38a*; Beddome 41: *36*; 42: *36*; Beguin 569: *32*; Béjaud 401: *50*; 486: *46*; 487: *46*; 856: *37*; Berar 8014: *50*; Berkett 963: *43*; Berkhout s. n.: *30*; 72: *30*; Bernardo FB 15206: *27b*; Bernier s. n.: *18*; Best s. n.: *47*; Betche s. n.: *19*; Beumée 515: *50*; 3470: *50*; 3871: *47*; 5248: *50*; Bick 77: *19*; Blackburn s. n.: *18*; Bloembergen 172: *50*; 3772: *50*; Blume s. n.: *38a, 38d, 47, 55*; 1519: *55*; 1687: *38a*; 1823: *38a*; Bo Pu 2539: *50*; de Boer 4038b: *55*; Boerlage s. n.: *30, 47, 55*; 157: *30*; 158: *55*; Boivin s. n.: *7, 18*; Bojer s. n.: *7*; Bol 4: *55*; Bolster 400: *27a*; Bon 5299: *45*; 5421: *45*; Bonar CF 6326: *41*; Boots 4038: *55*; Bor 8506 & 8507: *36*; Borden FB 1259: *27a*; 3063: *23*; Bouel s. n.: *19*; Bourne s. n.: *50*; 2220: *47*; 2451: *47*; Bouton s. n.: *18*; Branderhorst 37: *19*; Brandis s. n.: *43, 52a, 55*; 1214: *55*; 1215: *52a*; 1216: *50*; Brass 2381: *19*; 2957: *14*; 3242: *14*; 3353: *12*; 3418: *14*; 5282: *10*; 5713: *19*; 6821: *20*; 7275: *20*; 7571: *19*; 14035: *21*; 14114: *13*; Brass & White 146: *19*; Bridges FB 5163: *27a*; Britton & Britton 7451: *47*; Broadway s. n.: *30*; Broekhuizen s. n.: *30*; 9: *30*; 15: *30*; Brown s. n.: *27a*; Bruggeman & Hagen 987: *55*; Buchanan s. n.: *50, 54a*; 66 B: *54a*; Bünnemeyer 1351: *30*; 1731: *30*; 1807: *30*; 2510: *30*; 5966: *30*; 6933: *30*; 12558: *50*; Bulakidass s.n.: *47*; Bulkley s.n.: *47*; Burbidge s. n.: *30*; Burke 1: *27a*; Burkill s. n.: *47*; SF 1357: *41*; Burkill & Haniff SF 12409: *46*; 16853: *46*; 16856: *38b*; Burma Forest School Series 16: *54a*; 35: *54a*; 41: *54a*; Herbarium Burman s. n.: *7, 47*; Burn-Murdoch s. n.: *38b*; 132: *4*; Burut Ho BNB 1887: *38a*; Buwalda 4291: *13*; 7141: *38b.*

Cabiling BNB 3776: *30*; Calder & Ramaswami 80: *50*; Calliran FB 25661: *28*; Campbell s. n.: *54a*; 8782: *54a*; Cantley s. n.: *37, 48*; Caroll 7170: *38c*; 7176: *48*; Carr 13052: *10*; 15990: *10*; Castillo 619: *38a*; Castro 977: *38c*; BNB 7273: *34*; BNB A 40: *38a*; PNH 5719: *22*; Castro & Melegrito 1502: *30*; 1719: *38a*; Cave s. n.: *50*; Cenabre s. n.: *27a*; Champion s. n.: *7, 43*; Chapelier s. n.: *7*; Chaper s. n.: *30*; Chevalier 29174: *47*; 29764: *50*; 30935: *46*; 31753: *46*; 31988: *46*; 32544: *45*; 38602:

45; Chuma s. n.: *51*; Chun 6494: *45*; Clarke 4847: *47*; 12061: *50*; 13843: *50*; 34780: *50*; 38139: *50*; 43201: *50*; Clason A 105: *50*; Cleghorn 29: *50*; Clemens 3407: *47*; 3916: *45*; 4120: *45*; 9504: *30*; 21167: *30*; 22502: *30*; 51317: *30*; BS 15744: *27a*; Cloisel 93: *7*; Coert 1630: *30*; Collett 593: *54a*; Collins 152: *46*; 349: *46*; 517: *46*; 713: *46*; 812: *46*; 858: *46*; 1130: *46*; Comision de la Flora Forestal Filipinas 3: *39*; 940: *39*; Comins 291: *14*; Commerson s. n.: *7*; Concord, Sulit, & Colese PNH 6377: *26*; Conde de Val Flov s. n.: *47*; Convict s. n.: *50*; Copeland 508: *27a*; Corner s. n.: *2, 32, 38a, 46, 55*; SF 21189: *30*; 26041: *48*; 29300: *2*; 29335: *38a*; 29369: *2*; 30678: *33b*; 31510: *38b*; 32546: *38c*; 32548: *38c*; 32948: *30*; 33445: *55*; 33450: *55*; 33500: *55*; 33531: *55*; 33546: *30*; 33547: *30*; 34906: *32*; 37059: *2*; Corner & Herklots s. n.: *38c*; Couderc s. n.: *37*; Counillon s. n.: *37*; Cowan s. n.: *47*; Creagh s. n.: *30, 38a, 38b*; Crupto s. n.: *47*; Cuadra BNB A 876: *38a*; A 1019: *38a*; A 1358: *32*; A 2147: *38a*; Cuming 930: *27a & 29*; 1728: *22*; 2358: *30*; Cunningham 206: *19*; Curran FB 3475: *39*; 4518: *44*; 7685: *27a*; 10192: *27a*; 10405: *29*; 10608: *29*; 10712: *26*; 10755: *27a*; 17196: *29*; 17199: *28*; 17405: *29*; 19283: *27a*; Curtis s. n.: *30, 32, 46, 47, 55*; 228: *46*; 257: *38b*; 1379: *48*; 2311: *41*; 2312: *33b*; 2465: *32*; 2685: *32*; 2924: *55*; 3184: *38b*; 3489: *41*.

Dachlan 17: *30*; Daemel s. n.: *19*; Dahl s. n.: *43*; Dallachy s. n.: *19*; Danao FB 21574: *39*; Darling FB 14815: *27a*; 18740: *28*; Debbarman 345: *47*; 401: *50*; Decary 5253: *7*; 10934: *7*; 11056: *7*; Degener 12821: *47*; 14654: *17*; 15523: *17*; Degener & Ordonez 13839: *17*; Delessert s. n.: *30*; Derry 46: *38b*; 380: *41*; 446: *48*; 505: *48*; 1025: *38b*; 1077: *41*; 1083: *47*; 6257: *38b*; Deshmukh s. n.: *38c, 41, 47*; Detch s. n.: *43*; Diaz & Alambra BS 22812: *27a*; Dickason 5836A: *52c*; Diepenhorst 2124 HB: *38d*; 2509 HB: *38d*; Director of Agriculture (Ceylon) s. n.: *7, 43*; Dirksen 1: *38d*; 16: *38a*; 19: *46*; Docters van Leeuwen 4810: *37*: 9152: *21*; 9713: *21*; 11079: *13*; 11127: *21*; 11221: *21*; Docters van Leeuwen-Reynvaan s. n.: *30*; Dommers 17: *50*; Donald s. n.: *50, 54c*; Duthie 9267: *50*.

Ebalo 401: *44*; Eberhardt 2779: *45*; 5051: *50*; Edaño BS 42382: *27a*; 45980: *27a*; 46097: *29*; PNH 208: *39*; Edgeworth s. n.: *47*; 49: *47*; Elkman 15666: *47*; Elbert s. n.: *55*; Elgincolin FB 27839: *27a*; Ellis 31: *50*; Elmer 6127: *27a*; 7149: *27a*; 8927: *27a*; 10532: *27a*; 11883: *26*; 12087: *42*; 12906: *39*; 13564: *27a*; 13888: *26*; 15041: *27a*; 15408: *26*; 15619: *29*; 17605: *27a*; 18025: *29*; 18045: *29*; 20051: *38a*; 20104: *30*; 21028: *41*; 21159: *38a*; Elumir FB 28257: *27a*; Endert 13: *55*; 347: *48*; 1349: *46*; 1421: *38a*; 2347: *47*; 4832: *32*; 5077: *32*; 5176: *33c*; 5187: *38a*; E 810: *38b*; E 1318: *38d*; 201-E-3P-966: *38a*; 201-E-3P-981: *38a*; Enoh 290: *30*; Escritor BS 21555: *44*; BS 21642: *44*; Espinosa FB 6417: *27a*; Evrard 168: *37*; 792: *46*; 811: *37*; 872: *50*; 2405: *40*.

Fairchild 1079: *7*; 1080: *7*; Fairchild & Dorsett 262: *30*; Falconer s. n.: *52c, 55*; 78: *47*; 271: *47*; Feilding s. n.: *30*; Fénix 92: *30*; BS 4146: *27a*; 12645: *27a*; 15647: *44*; 15653: *38b*; 28210: *27a*; 29999: *27a*; Feuilletau de Bruyn 72: *21*; 200: *13*; Fevrell & Heide s. n.: *30*; Fischer 4719: *36*; 4787: *36*; Fisher 1825: *50*; 3367: *50*; Fitzalan s. n.: *19*; Fleury 30084: *46*; 30126: *45*; 30193: *47*; 37429: *45*; Forest Officer s. n.: *47*; 1: *47*; Forest Research Ranger s. n.: *36*; 335: *36*; Forbes s. n.: *47*; 1303: *47*; 1607: *41*; 2832: *33b*; 2974: *32*; 3002: *32*; 3040a: *33b*; 3229: *38b*; 3255a: *38b*; Forrest 11823: *52a*; 13601: *52a*; Forsten s. n.: *25*; Fox PNH 4766: *27a*; 8966: *27a*; Foxworthy BS 102: *27a*; 549: *39*; Foxworthy & Ramos BS 13167: *26*; Franck 133: *55*; 353: *41*; 1025: *38b*; 1115: *30*; Frazer 120: *30*; Fristedt s. n.: *19*; Fung 20079: *45*; Furtado SF 34822: *30*.

Gallatly 799: *52b*; Gamble s. n.: *47*; 1070: *47*; 3873: *50*; 8785: *54c*; 18745: *7*; 24690: *47*; Gamill FB 263: *27a*; Gaudichaud s. n.: *19, 27a, 55*; 26: *30*; 283: *27a*; Geay 7235: *7*; 7261: *7*; 7344: *7*; 8043: *7*; Gibbs 2806: *38a*; 2930: *30*; Giesenhagen s. n.: *30*; Gillespie 2182: *17*; 3529: *17*; Gjellerup 208: *21*; Godefroy 181: *37*; 233: *50*; Goodenough s. n.: *30, 46*; 1263: *47*; 1500: *41*; 1983: *41*; 2005: *38b*; 10470: *30*; 10623: *38b*; Gourgand 4: *37*; 5: *37*; 7: *37*; Grashof 124: *32*; 151: *38a*; 487: *38d*; 763: *32*; 801: *38b*; 1150: *47*; Greenway 1585: *47*; Greenwood 521: *17*; 596: *17*; 1120: *17*; Griffith s. n.: *30, 38b, 47, 48, 51*; 42: *55*; 50: *52a*; 51: *41*; 54: *48*; 54A: *38b*; 55: *30*; 55A: *47*; Guillot 53: *7*; le Guillou s. n.: *14*; Gull s. n.: *19*; Gupta s. n.: *47*; Gusdorf 53: *38b*; 181: *38a*; 182: *38a*; 187: *46*; 244: *38d*; Gwynne-Vaughan 456: *55*.

de Haan 1715: *8b*; Hahn s. n.: *55*; 31: *37*; 126: *46*; 1156: *47*; Haines 21: *54a & 54c*; 21a: *54a & 54c*; 536: *50*; 2106: *50*; Hallier s. n.: *47*; 2a: *30*; 108: *38a*; 1292: *32*; 1460: *33c*; 3066: *34*; 4432: *27a*; 4432b: *27a*; B 220: *38a*; Ham 32: *30*;

L 7: *4*; Hamid CF 602: *38b*; 969: *41*; 4773: *41*; 5166: *38b*; 10686: *41*; 10687: *33c*; 11050: *47*; Hamilton s. n.: *19*; 1256: *47*; 1258: *51*; 1259: *50*; Hance 22255: *19*; Haniff 53: *47*; SF 13120: *30*; Haniff & Nur SF 7073: *46*; Hann Northern Expedition 163: *19*; Harmand s. n.: *50*; 296: *46*; 444: *50*; 652: *40*; 855: *46*; 1321: *55*; van Harreveld s. n.: *30, 38a, 47*; Harris 10889: *30*; Harsukh 21380: *54a*; 21446: *50*; 21446a: *50*; 21447: *50*; Hartmann s. n.: *19*; Haslett 7/1585: *54a*; van Hasselt s. n.: *38a*; Haviland s. n.: *30*; 1517: *32*; 1975: *48*; 1989: *38c*; 2047: *1*; 2100: *30*; 2213: *48*; 2214: *48*; Haviland & Hose 2160: *30*; Heinig 105: *53*; Helfer s. n.: *43*; Henderson SF 1347: *41*; 10014: *30*; 10309: *47*; 10358: *30*; 21801: *33b*; 22064: *47*; 22589: *46*; 22654: *47*; 23889: *46*; 29560: *47*; Henry 8622: *45*; 12746: *47*; Herre 298: *21*; 308: *21*; 371: *21*; 1010: *44*; Hervey s. n.: *30*; van Heurn s. n.: *47*; Hewitt s. n.: *38a*; Hill 117: *19*; Hole 854: *50*; Holmberg 719: *30*; Holttum SF 9359: *2*; 9757: *41*; Hooker s. n.: *47*; Hooker & Thomson s. n.: *47, 50, 51*; Horne s. n.: *17*; 340: *18*; Horsfield s. n.: *30, 38a*; 96: *38a*; 719: *38a*; Hose 118: *38b*; 280: *38b*; Houter 158: *55*; 159: *50*; Herbarium Houttuyn s. n.: *7, 47*; How 70322: *50*; 70391: *45*; 70953: *45*; 71792: *45*; 72058: *45*; 72084: *45*; 72444: *45*; How & Chun 70272: *45*; de Hügel s. n.: *43*; Huitema 24: *30*; Hullett s. n.: *30*; 61: *30*; Humblot 336: *7*; Hume 8322: *38b*; Hutchinson FB 6108: *27a*; Huting s. n.: *38b*.

Iboet 106: *41*; 238: *38a*; 452: *50*; Idris s. n.: *30*; Inayat 21446b: *50*; 23549: *50*; 23550: *54a*; Ingram NGF 960: *13*.

Jack s. n.: *47*; Jaheri s. n.: *19*; 840: *34*; 1284: *38a*; 1360: *38a*; 1893: *38a*; Jameson s. n.: *47*; Janse s. n.: *30*; Jansen 4652: *50*; Jenkins s. n.: *47*; 348: *47*; Jeoward 89: *17*; Johnson s. n.: *19*; Junghuhn s. n.: *38d, 47, 55*; 693: *38a*.

Kadir BNB A 901: *30*; A 927: *38b*; A 2691: *30*; Kajewski 132: *17*; 323: *17*; 1740: *16*; 1973: *12*; Kalong CF 17479: *30*; 20295: *41*; 20469: *38b*; 23402: *46*; Kamphövener 2866: *53*; Kanehira 1836: *21*; 2493: *27a*; Kanjilal s. n.: *51*: Karsten s. n.: *19*; Keith BNB 7212: *38b*; 9091: *30*; Kelaart s. n.: *43*; Kelsall 1847: *41*: Kenny s. n.: *19*; Kerr s. n.: *46, 50*; 1046: *52b*; 1063: *54c*; 1787: *52a*; 4337: *47*: 5235: *52b*; 5803: *46*; 5844: *37*; 5869: *46*; 6929: *55*; 7133: *38b*; 8272: *46*; 8746: *50*; 8847: *46*; 9519: *46*; 10493: *52a*; 10499: *55*; 10556: *50*; 11440: *55*; 13077: *37*; 13348: *47*; 13625: *55*; 13695: *37*; 13811: *55*; 14020: *55*; 14798: *55*; 15330: *46*; 16829: *55*; 19352: *55*; 20039: *50*; 20081: *46*; 20730: *37*; Kewalramani 1: *47*; Khan s. n.: *47*: Kiah s. n.: *30*; SF 32016: *2*; 32190: *38c*; 35212: *46*; 38310: *2*; King s. n.: *47, 53*; King's Collector: see under Kunstler; Kirat Ram 3789: *53*: Kistnasawmy 1856: *47*; Kjellberg 194: *4*: 579: *4*; 2226: *3*; 2226a: *3*; Klemme FB 18617: *27a*: Kloss s. n.: *21, 38b*; 6474: *38b*; 6485: *38b*; 6731: *55*: 19089: *38b*; SF 14083: *41*; Ko 52211: *45*; König s. n.: *7, 47*; Konishi 21959: *45*; Koorders s. n.: *55*; all the following numbers are β-numbers; 1581: *50*; 1582: *50*; 1583: *50*; 1584: *50*; 1585: *50*; 1586: *50*; 1587: *50*; 1588: *50*; 1590: *50*; 1591: *50*; 1592: *50*; 1593: *50*; 1595: *50*: 1596: *50*; 1598: *50*; 1599: *50*; 1600: *50*; 1601: *50*; 1603: *50*; 1604: *50*; 1605: *50*; 1606: *50*: 1607: *50*: 1608: *50*; 1609: *50*: 1610: *50*: 1611: *50*: 1612: *55*: 1613: *50*: 1614: *55*: 1615: *55*; 1616: *55*; 1617: *55*; 1618: *55*; 1619: *55*; 1620: *50*; 1621: *47*; 1622: *47*; 1623: *47, 55*; 1624: *55*; 1625: *47*; 1626: *47*; 1627: *47*; 1628: *47*; 1630: *50*; 1631: *55*; 1633: *50*; 1634: *55*; 1635: *50*; 1636: *50*; 1637: *50*: 1638: *50*: 1639: *38d*: 1640: *38d*: 1641: *38a*: 1642: *38d*; 1643: *38a*; 1644: *38a*; 1645: *38d*; 1697: *50*; 10289: *33c*; 10290: *47*; 10291: *33c*; 10292: *38a*: 10293: *38a*: 10294: *38a*: 10505: *41*: 11424: *50*: 11425: *50*; 11426: *47*; 11735: *55*; 11874: *50*; 12895: *50*; 12896: *50*; 14043: *55*; 14293: *50*; 14826: *47*; 16709: *25*; 16710: *25*; 16711: *25*; 16712: *25*; 16713: *25*; 16714: *25*; 19382: *3*; 20110: *38d*; 20195: *38d*; 20251: *55*: 20268: *38d*; 20731: *50*; 22743: *50*; 24634: *38d*; 24671: *55*; 24824: *38d*; 24841: *38d*; 25115: *50*; 25517: *47*; 26871: *38a*; 26872: *38a*; 27350: *47*; 28247: *50*; 29206: *50*; 30593: *55*; 30956: *55*; 33102: *55*; 33252: *50*; 35492: *50*; 36127: *50*; 36515: *50*; 36915: *47*; 36922: *50*; 38473: *50*; 38719: *50*; 39277: *38a*: 39777: *50*; 39840: *50*; 40026: *50*: 41138: *55*; 42226: *55*; Korthals s. n.: *30, 32, 33c, 38a, 38d, 47, 55*: Kostermans 246: *52a*: 374: *55*; 751: *47*; 846: *47*; 2852: *21*; Krempf s. n.: *46*: Krukoff 271: *38d*; 298: *41*; 4047: *41*; Kunstler 504: *38b*; 858: *41*; 2472: *48*; 2857: *38b*: 4429: *46*: 4779: *41*: 5787: *41*: 5905: *32*: 8151: *41*; 10175: *41*: 10573: *48*: Kuntze 4898: *46*: 6094: *30*: Kurz s. n.: *25, 30, 43, 47, 50, 51, 53, 55*: 38: *50*; 39: *52a*; 40: *54a, 54c*; 40b: *55*: 155: *50*; 320: *52a*; 425: *30*; 1805: *47*; 1806: *50, 52a*; 1807: *54a*; 1808: *55*: 2961: *30*.

Labohm 1180: *30*; 1956: *30*; Labroy s. n.: *47*; Lace s. n.: *54a, 54b, 55*; 2185: *50*; 6193: *54a*; Ladbrook s. n.: *19*; Lahaye s. n.: *55*; 2214: *47*; Lakshnakara 650: *55*;

912: *37*; 1377: *46*; Lam 477: *21*; 485: *21*; 1003: *13*; 3072: *24*; Herbarium Lamarck s. n.: *7*; Lambert & Brunson 39: *27a*; Land s. n.: *30*; Lane-Poole 118bis: *30*; 226: *9*; 631: *21*; Langlassé 68: *30*; 87: *30*; Lau 1439: *45*; 1743: *50*; 3687: *45*; 6232: *50*; 6260: *45*; 25919: *45*; Lauterbach 474: *46*; Law s. n.: *50*; Lea s. n.: *19*; Ledermann 6752: *21*; Lei 461: *45*; 715: *45*; Lela CF 2677: *48*; Lemaire s. n.: *50*; Lete 86: *27a*; Lewis 257: *38b*; Liang 61542: *50*; 61621: *45*; 62040: *45*; 69570: *45*; 62066: *50*; Lister s. n.: *47*; 262: *50*; 377: *51*; Lizardo FB 30506: *23*; Lobb s. n.: *27a*; 329: *30*; Lörzing 3298: *38b*; 9081: *47*; 11585: *41*; Lörzing & Jochems 7603: *41*; Loher s. n.: *27a*; 16: *27a*; 17: *27a*; 18: *27a*; 19: *27a*; 20: *30*; 6765: *27a*; 13239: *23*; 14940: *23*; BS 12069: *28*; 13749: *28*; Louvel 238: *7*; Low 22: *38a*; 192: *30*; Lütjeharms 3970: *38d*; Lupang BNB 5403: *38c*; Lynn Zwickey 128: *27a*; 803: *6*.

MacClure 9275: *45*; 20038: *50*; BS 16091: *47*; MacClure & Fung 18288: *45*; MacFarlane s. n.: *19*; MacGillavry 418: *19*; MacGregor 147: *27a*; Machenas s. n.: *19*; Macrae 301: *7*; Magnien & Gourgand s. n.: *37*; Maidin BNB 1678: *38d*; 2346: *38a*; 7330: *38a*; Main 1782: *48*; 1839: *38a*; 2145: *38a*; Main & Aden 984: *8b*; 1304: *8b*; Maingay 4: *30*; 5: *48*; 6: *38b*; 7: *41, 47*; 8: *33a*; 1020: *30*; 1298: *41*; 1333: *38b*; 1440: *48*; 1620: *33a*; 2624: *30*; Mal CF 17849: *32*; Mann 140: *51*; Manson s. n.: *35*; Manuel FB 23485: *27a*; Marcan 299: *47*; Martelino & Edaño BS 35444: *28*; Masters s. n.: *50*; 56: *47*; 1935: *47*; N 1737: *35*; Mathieu s. n.: *38c*; Maung Mya 2813: *54c*; May 97: *45*; Mayr s. n.: *43*; 239: *13*; Mearns 199: *27a*; 200: *27a*; Meebold 12732: *50*; 14464: *52a*; 14610: *55*; 14737: *47*; 15160: *52a*; 15199: *55*; Meh CF 9020: *38b*; 9041: *46*; 9045: *38b*; 10316: *33b*; 17790: *46*; Melegrito BNB 2504: *48*; BNB 2509: *48*; Mendozo & Convocar PNH 10289: *22*; 10316: *26*; Merrill 1002: *27a*; 1185: *27a*; 1656: *27a*; 1918: *27a*; 2182: *27a*; 2206: *27a*; 2827: *27a*; 9237: *44*; 2947: *27a*; BS 8062: *26*; Merritt FB 9687: *27a*; Mg Me 927: *52a*; Mg Po Khaut 11438: *52b*; Miranda FB 17961: *27a*; 18972: *27a*; 20534: *5*; Mokim 567: *55*; de Monchy s. n.: *47*; Montano 137: *27a*; 206: *27a*; Mooney 2034: *50*; Motley 802: *38a*; 895: *32*; Moysey & Kiah SF 33458: *32*; 33708: *32*; 33871: *47*; von Mueller s. n.: *47*; Müller 300: *46*; 994: *46*; 1711: *46*; 1971: *46*.

Nagara Menon s. n.: *36*; Narayanaswami 173: *50*; Native Collector s. n.: *38b*; 557: *30*; 2406: *48*; 5282: *1*; Native Ranger 8275: *54a*; Neary s. n.: *50*; Neltkropp s. n.: *47*; Ngadiman s. n.: *32*; SF 26640: *48*; 36850: *2*; 36854: *32*; Niat s. n.: *48*; Nielsen 224: *17*; 835: *21*; NIFS bb 418: *38a*; 1074: *38a*; 1148: *38a*; 1647: *38a*; 1801: *38d*; 2104: *38d*; 2164: *38a*; 2270: *38d*; 2575: *38d*; 2948: *47*; 3122: *33c*; 3614: *33c*; 3771: *38d*; 3924: *4*; 5335: *38c*; 5713: *41*; 5864: *50*; 5921: *38a*; 5922: *55*; 5972: *38d*; 6296: *38a*; 6334: *48*; 7015: *34*; 7300: *38c*; 7388: *32*; 7489: *32*; 7505: *4*; 7528: *25*; 7679: *38c*; 7700: *38c*; 7717: *55*; 7872: *32*; 7966: *38c*; 7998: *38d*; 8017: *32*; 8051: *38d*; 8202: *38a*; 8333: *55*; 8467: *32*; 8472: *55*; 8705: *38d*; 8728: *32*; 8859: *38d*; 9226: *38d*; 9509: *32*; 9748: *38d*; 10041: *38d*; 10080: *32*; 10399: *34*; 10516: *38d*; 10844: *32*; 10919: *38d*; 11526: *38d*; 11677: *38d*; 12086: *38d*; 12112: *34*; 12249: *38a*; 12477: *48*; 12657: *25*; 12796: *38d*; 12822: *32*; 12860: *48*; 13044: *33c*; 13396: *34*; 13401: *38d*; 13540: *4*; 13605: *48*; 13611: *47*; 13747: *4*; 13755: *3*; 13942: *38a*; 14075: *32*; 14166: *38a*; 14208: *33b*; 14244: *48*; 14961: *33b*; 15054: *13*; 15092: *48*; 16119: *32*; 16140: *32*; 16144: *32*; 16174: *38d*; 16224: *38c*; 16232: *38c*; 16251: *32*; 16256: *32*; 16964: *38c*; 17140: *32*; 17173: *48*; 17404: *48*; 17407: *48*; 17484: *38d*; 17563: *25*; 17701: *48*; 18085: *25*; 18571: *34*; 18572: *32*; 18698: *38d*; 19453: *38a*; 19724: *38d*; 20104: *32*; 22124: *13*; 21129: *4*; 21131: *4*; 21524: *33c*; 22293: *13*; 22474: *47*; 22535: *21*; 23129: *6*; 23146: *6*; 23750: *6*; 24305: *13*; 24646: *33c*; 24828: *32*; 25300: *13*; 25596: *33c*; 25653: *13*; 26040: *38d*; 26220: *38c*; 26498: *33c*; 26864: *32*; 27288: *50*; 27478: *32*; 28108: *34*; 28567: *48*; 28616: *32*; 28710: *48*; 28988: *21*; 29228: *38d*; 30333: *8a*; 30343: *8a*; 30605: *21*; 30755: *13*; 31018: *48*; 31025: *32*; 31738: *32*; 32918: *13*; 33318: *13*; 33464: *13*; 33541: *13*; 33706: *34*; Ja 1253: *55*; 1598: *50*; 1629: *50*; 2039: *50*; 2624: *38d*; 3962: *55*; K 7: *50*; T 3 P 830: *55*; T 1062: *48*; T 1209: *48*; TB 652: *38d*; TB 654: *38d*; Noerkas 296: *50*; Noltée 4033: *50*; 4038: *55*; Nur s. n.: *2, 30, 38c, 47, 48*; 175: *48*; 1437: *38c*; 1545: *47*; 1892: *38c*; SF 18197: *32*; SF 34430: *30*; Ny Pya 1: *54a*.

Officers of H.M.S. Penguin s. n.: *12*; Official Supervisor s. n.: *47*; Omar 82: *41*; 367: *1*; Oro FB 30799: *23*; Osborne-Day 238: *18*; Osman CF 7046: *33c*; Osmar & Tachun CF 23660: *41*; Oswon CF 27951: *47*.

Packmann s. n.: *55*; Paniza PNH 9407: *29*; Paraiso FB 25081: *27a*; 31262: *23*; Parham 100: *17*; Parker 2209: *47*; 2668: *55*; Parkinson 581: *53*; 607: *52a*; 925: *50*;

1185: *53*; 1604: *55*; 1924: *52a*; 2040: *55*; 14029: *30*; 14144: *52a*; 14455: *30*; 14459: *47*; Parks 10291: *17*; 20095: *17*; 20497: *17*; Parry 213: *50*; 513: *50*; Pearson 935: *43*; 962: *7*; Peekel 117: *10*; Pekrie s. n.: *19*; Perrier de la Bathie 10127: *7*; 14098: *7*; 17409: *7*; Persietz s. n.: *19*; 16: *19*; Pervillé s. n.: *18*; Pervillé & Wright s. n.: *18*; Pételot s. n.: *37*; 2401: *45*; 4581: *45*; 4698: *37*; 5470: *45*; du Petit-Thouars s. n.: *7*; Pierre s. n.: *7, 38a, 43, 46, 47, 50, 52a, 55*; 144: *46*; 589: *55*; 599: *50*; 661: *50*: 663: *37*; 725: *46*; 765: *51*; 767a & 767b: *46*; 768: *55*; 769: *55*; 770: *55*; 771: *55*; 1601: *50*; 1799: *46*; 1875: *50*; 2037: *46*; 2038: *46*; 2039: *46*; 2040: *46*; 2041: *51*; 2042: *40*; 2043: *55*; 2045: *50*; 2046: *46, 50*; 2047: *50*; 2943: *51*; 3257: *55*; 3300: *55*; 3381: *47*; Piper BS 79: *27a*; Pitch s. n.: *7*; Pleyte 511: *20*; 618: *21*; Ploem s. n.: *30, 55*; Po Khaut 11: *54a*; Po K'Laut 106: *52a*; 168: *50*; Poilane s. n.: *46, 47*; 199: *46*; 464: *37*; 1126: *45*; 1287: *46*; 1356: *50*; 1582: *45*; 1733: *47*; 4802: *40*; 5130: *40*; 5817: *46*; 6694: *46*; 7253: *45*; 7274: *45*; 7581: *45*; 8248: *45*; 8356: *40*; 10395: *45*; 11139: *45*; 11594: *37*; 11822: *46*; 12073: *46*; 13843: *37*; 14889: *50*; 15292: *37*; 16643: *47*; 17849: *40*; 22044: *45*; 23794: *45*; 24678: *46*; 26219: *51*; 26411: *51*; 26961: *47*; 27321: *37*; 27324: *46*; 29297: *45*; 29570: *45*; 29764: *45*; 29874: *45*; 30065: *46*; 32373: *46*; Poivre s. n.: *27a*; Polak 140: *30*; 680: *30*; de Poli s. n.: *43*; Ponce FB 20500: *5*; Porter s. n.: *46*; Posthumus 1025: *38b*; Pottinger s. n.: *54a*; Prain's Collector s. n.: *53*; 27: *53*; Prazer 388: *54a*; Pringgo Atmodjo 451: *47*; Puasa 2550: *38d*; BNB 4846: *30*; Punyabukkana 861: *55*; Put 649: *46*.

Quisumbing s. n.: *30*; 7970: *27a*; BS 84737: *30*; PNH 2428: *27a*; 8059: *27a*.

Rabil 22: *46*; 173: *38b*; Rachmat 834: *4*; Rahim CF 12061: *38a*; Rahman CF 1801: *41*; Rahmat Si Boeea 1055: *41*; 6597: *38a*; 6616: *41*; 9628: *41*; Rahmat Si Toroes 828: *41*; 2540: *38a*: 3262: *38a*; Ramaswami 1544: *50*; Ramos 598: *27a*; 1082: *27a*; 1379: *38a*; 4958: *27a*; BS 1695: *22*; 13627: *29*; 17581: *26*; 19512: *28*; 23354: *29*; 23685: *26*; 23807: *29*; 24483: *26*; 27332: *27a*; 30344: *28*; 30497: *29*; 33034: *6*; 33300: *28*; 41245: *44*; 42013: *27a*; Ramos & Convocar BS 83388: *27a*; 84085: *26*; Ramos & Edaño BS 28959: *26*; 29122: *29*; 29145: *26*; 33518: *27a*; 33527: *27a*; 36629: *26*; 36824: *27b*; 37254: *26*; 37445: *26*; 38653: *27a*; 44038: *27a*; 44636: *27a*; 45486: *27a*; 46530: *27b*; 49429: *29*; 75107: *29*; 75247: *28*; Ramos & Pascasio BS 34770: *27a*; 34784: *22*; Rant s. n.: *50*; 433: *50*; Reillo BS 16339: *6*; Reppie 160: *4*; Rich 125: *47*; Richards 2536: *38b*; Ridley s. n.: *30, 32, 38b, 38c, 41, 46, 47, 48, 55*; 435: *30*; 1499: *48*; 2614: *46*; 2625: *38b*; 2637: *38b*; 2673: *47*; 3702: *47*; 3965: *48*; 3966: *30*; 4713: *48*; 5370: *38b*; 5849: *48*; 6178: *32*; 6382: *38c*; 6809: *38c*; 11053: *2*; 12625: *38b*; 13388: *38b*; 14083: *38b*; 14586: *46*; 14587: *47*; 15182: *46, 55*; 15758: *55*; Riedel s. n.: *25, 30*; HB 5899: *3*; Ritchie s. n.: *50*; 297: *50*; Robertson 140: *51*; Robinson 1266: *40*; 1479: *40*; Rodger 2: *54a*; Rogers s. n.: *53*; 291: *54a*; 963: *54a*; Rostrup 120: *7*; Rottler s. n.: *43, 47, 50*; Rowan s. n.: *19*; Roxburgh s. n.: *47, 50*; Herbarium van Royen s. n.: *7*; Royle s. n.: *47*; Rudolf s. n.: *43*; Rupel s. n.: *50*; Rutten 88: *30*; 95: *38a*; 417: *30*; 496: *30*; 583: *32*.

Salvoza 594: *47*; Sargent s. n.: *30*; Sayer s. n.: *19*; Schimper s. n.: *18*; 106: *18*; Schl. s. n.: *55*; Schlechter 16994: *21*; 18622: *10*; 18910: *21*; 20007: *20*; Schlich s. n.: *50*; 15001: *47*; Schmidt 417: *46*; 648: *46*; Scortechini s. n.: *38b, 41, 46, 47*; 96a: *38b*; 222b: *38b*; 403: *47*; 1092: *38b*; 1155: *46*; 1840: *33a*; 1864: *32*; 1910: *41*; 1910a: *41*; Scott s. n.: *50, 52a*; Scott Elliot 2469: *7*; 2823: *7*; Seemann 2: *17*; Seidenfaden 2763: *46*; Seimund 918: *46*; Sein Syi 957: *52a, 55*; 958: *55*; Serell s. n.: *7*; Serviñas BS 16921: *27a*; Shaik Mokim s. n.: *54a*; 19: *54a*; 104: *54a*; Sharma 22: *47*; Shri Ram 10: *54*a; Silviculturist Burma s. n.: *49*; Simond s. n.: *46*; Simons s. n.: *47*; Simpson 8942: *7*; Sinclair s. n.: *47*; 3199: *47*; SF 38934: *2*; Siriban FB 30393: *27b*; Sis Ram s. n.: *50*; A. C. Smith 1696: *17*; E. G. Smith 479: *55*; L. S. Smith NGF 1026: *11*; 1229: *31*; Somerville CF 14354: *38b*; Spanoghe s. n.: *38d*; Spare SF 34568: *38b*; 36206: *48*; 37605: *38b*; Spire 264: *47*; 317: *47*; Squires 320: *46*; 775: *46*; Stadtmiller, Ferraris, & Almagro FP 20099: *6*; Standley 30869: *47*; Standley Gardiner s. n.: *18*; van Steenis 1055: *30*; 2278: *38a*; 3175: *38a*; 8248: *55*; 11460: *55*; 12681: *30*; Stewart s. n.: *50, 54a*; Strugnell CF 12622: *30*; 12695: *33b*; 13605: *38b*; 13955: *38b*; Suksakorn 924: *37*; 935: *46*; Suleiman BNB 2182: *48*; 2221: *30*; Sulit PNH 3660; *29*; 6144: *22*; 6977: *30*; 6978: *27a*; 8209: *29*; 10103: *27a*; 12289: *39*; Sus Ram 18: *54a*; Sykes 71: *17*; Symington CF 22863: *41*; 22936: *38b*; 22979: *38c*; 32870: *38b*; 39460: *32*.

Tachun CF 16921: *38b*; 39256: *33b*; Talmy s. n.: *37*; 6: *46*; 66: *7*; Tarrosa FB 15165: *29*; Teague 3: *47*; Teysmann s. n.: *30, 32, 38a, 38c, 46, 48, 50, 55*; 453 HB: *47*; 455 HB: *32*; 3417 HB: *38c*; 3615 HB: *38d*; 3641 HB: *38d*; 4259 HB: *38a*;

4402 HB: *32*; 5535 HB: *6*; 5886 HB: *6*; 8145 HB: *48*; 8146 HB: *38a*; 8147 HB: *33c*; 10667 HB: *50*; Teysmann & de Vriese s. n.: *25*; Thomasset s. n.: *18*; 203: *18*; Thomsen 631: *21*; 814: *21*; Thomson 10: *30*; 35: *19*; Thorell s. n.: *47, 50*; 657: *37*; 968: *46*; 1335: *50*; 1566: *37*; Thorenaar 95-E-1P-760: *32*; 95-E-1P-924: *32*; 95-E-3P-T898: *32*; T-3P-873: *32*; T 1138: *38d*; Thung v. Dieu 76: *46*; Thwaites CP 1013: *7*; 2960: *43*; 2961: *47*; Toppin 3131: *47*; Tothill 2: *17*; 41: *17*; Treacher s. n.: *30*; Tsang 351 LU 17100: *50*; 15730: *45*; 17025: *45*; 23992: *45*.

Usope CF 588: *38b*; U. S. South Pacific Exploring Expedition s. n.: *17, 30*.

Vanpruk 797: *37*; Velasco FB 23289: *27a*; Versteeg 1175: *21*; 1928: *19*; Vidal 4: *27a*; 941: *26*; 1098: *44*; 2022: *27a*; 2023: *27a*; 2024: *26*; 2025: *26*; 2026: *39*; 2035: *39*; 2036: *27a*; 2037: *27a*; 2038: *28*; 2039: *29*; Villamil 25: *38a*; 240: *41*; FB 23345: *29*; Vincent 4652a: *50*; Vinot 29: *46*; Voigt s. n.: *43, 47, 50, 51*; de Voogd 5: *30*; 200: *50*; 503: *38a*; 725: *50*; de Vriese s. n.: *6, 38a, 47, 55*; 30: *38a*; de Vriese & Teysmann s. n.: *38a*.

Walker s. n.: *7, 43, 47*; 55: *43*; 224: *30*; 1020: *7*; Walker CF 14153: *38b*; Walker & White BSIP 145: *15*; 145a: *15*; 146: *12*; Wallich s. n.: *47, 50, 51*; 77: *47*; 303: *50*; 826: *47*; 943: *47*; 944: *51*; 945: *46*; 947: *55*; 948: *50*; 949: *50*; 950: *50*; 951: *38b, 38d*; 1612: *55*; 6625a: *43*; Walter 35: *19*; Wang 32899: *50*; 32976: *45*; 36660: *45*; 74979: *47*; 75586: *47*; 75788: *47*; 76356: *50*; 76358: *47*; 78021: *47*; 78604: *47*; 81061: *47*; Warburg 20073: *21*; Ware FB 20: *27a*; Waterhouse B 510: *12*; Watson CF 6062: *2*; Watt 7173: *50*; Waturandang 10: *4*; 46: *4*; 147: *4*; Weber s. n.: *4*; Wenzel 3 J: *22*; 3 M: *29*; 402: *27a*; 954: *22*; 1419: *22*; 1685: *27a*; 2640: *27a*; 3112: *22*; Wetmore & Abbe 228: *30*; 239: *47*; White 547: *10*; 8807: *47*; Whitehouse s. n.: *19*; Whitford 646: *27a*; 1320: *23*; Wight s. n.: *7, 36, 43, 50*; 7: *7*; 12: *7*; 13: *36*; 14: *50*; 15: *50*; 21: *47*; 22: *50*; 23: *43*; 3027: *50*; Williams s. n.: *17*; 658: *27a*; 2003: *27a*; 2309: *27a*; 2906: *27a*; Wilson 965: *17*; Winkler 2710: *47*; Wisse 46: *50*; 59: *50*; 97: *25*; 117: *50*; Witkamp s. n.: *47*; Witt s. n.: *55*; Wolff von Wülfing 4245: *47*; Womersley NGF 3380: *11*; 3760: *13*; 3823: *21*; 3850: *21*; 3926: *13*; Wood s. n.: *50*; 458: *30*; 794: *30*; 925: *47*; Wood FB 12997: *27a*; Wray 735: *38b*; 2154: *47*; Wright s. n.: *18*.

Yakim CF 1984: *38b*; Yates 56: *30*; 820: *38a*; 1214: *38a*; 1306: *38a*; 2162: *38a*; Yeob CF 3616: *30*; 5832: *30*.

de Zeeuw s. n.: *9*; 30: *9*; Zippelius 98/1: *19*; 121/0: *21*; Zollinger 195: *55*; 1021: *38a*; 2358: *50*; 2672: *47*; 2835: *38d*; 3074: *38a*.

Index to scientific names

New taxa and combinations are printed in **bold face** type; synonyms and pre-Linnean names in *italics*. Page numbers in **bold face** type indicate descriptions. Figures are indicated by an asterisk (*).

Acrotrema 7, 11
Acrotremeae 7
Alatae Ridl. 11
Arbor indica flore maximo, cui multae innascuntur siliquae Ray 108
Arbor zeylanica fructu acidulo Godhapara dicta Herm. 100
Capellenia Hassk. 4
— *multiflora* Bl. ex Hassk. 87
— *pauciflora* Zoll. & Mor. 87, 88
Capellia Bl. 4, 6, 10
— (pro sect.) 10
— *biflora* A. Gray 45
— *membranifolia* A. Gray 45
— *multiflora* Bl. 4, 87, 88
— *pauciflora* Zoll. & Mor. ex Hook.f. & Jacks. 87
Catmon Kamel 62
Clugnia Comm. ex DC. 136
— *volubilis* Comm. ex Steud. 136
— *volupis* Comm. ex DC. 136
Clusia elliptica H. B. K. 136
— pavoni Planch. & Triana 136
— thurifera Planch. & Triana 136
Colbertia Salisb. 4, 6
— (pro sect.) 10
— *augusta* Wall. ex G. Don 118
— *coromandeliana* DC. 118
— *floribunda* Wall. 118
— *minor* Zoll. & Mor. 118
— *obovata* Bl. 130, 134
— *scabrella* D. Don 123, 125
Didesmandra 7, 11
Dilema Griff. 109
Dillenia L. 3, 4, 108, 113
— alata (DC.) Martelli 10, 16, 19, 49

— — Auct. 33
— — *var. macrophylla* Laut. 35, 36
— — — — Auct. 52
— *albertisiana* Martelli 52
— albiflos (Ridl.) Hoogl. 8, 11, 12, 16, 18, 22, **22**
— andamanica Parkinson 10, 16, 21, **127**
— *andreana* F. v. M. 136
— *angusta* Roxb. ex Hook.f. & Jacks. 118
— *apetala* (Gaud.) Martelli ex Dur. & Jacks. 50
— *aquatica* Moon 136
— *artocarpifolia* (Baker) Martelli ex Dur. & Jacks. 31
— *augusta* Roxb. 118
— aurea Sm. 5, 10, 16, 21, **128**, 134
— — Auct. 80, 105, 130
— — var. aurea **129**
— — *var. blumei* Pierre 131, 134
— — *var. harmandii* Pierre 131
— — *var. kurzii* Pierre 131, 134
— — **var. trichocarpella** Hoogl. **130**
— auriculata Martelli 10, 16, 19, **51**
— *baillonii* Pierre ex Laness. 118, 122
— beccariana Martelli 8, 16, 18, **21**, 23
— biflora (A. Gray) Martelli ex Dur. & Jacks. 9, 16, 19, **45**
— blanchardii Pierre 10, 16, 20, **96**
— bolsteri Merr. 10, 16, 19, **54**, *55
— **borneensis** Hoogl. 4, 10, 11, 16, 20, **80**, *81
— bracteata Wight 10, 16, 20, **84**
— *burbidgei* (Hook.f.) Gilg 70
— *calothyrsa* Diels 39
— castaneifolia (Miq.) Martelli ex Dur. & Jacks. 10, 12, 16, 19, **52**
— — *var. dolichobotrys* Diels 52
— *catmon* Elm. 63, 66
— *cauliflora* Merr. 54
— **celebica** Hoogl. 8, 12, 14, 16, 18, **24**, 27, *29
— *crassisepala* Martelli 75
— **crenata** (A. C. Smith) Hoogl. 9, 16, 19, **42**
— *dentata* Thunb. 6, 30
— **diantha** Hoogl. 10, 16, 19, **57**, *58, 96, 103
— *elata* Pierre 123
— — Auct. 125
— *elliptica* Thunb. 25, 26
— *elmeri* Merr. 97
— *elongata* Miq. 109
— excelsa (Jack) Gilg 4, 10, 16, 20, **86**, 88
— — *var. borneensis* (Miq.) Merr. 88
— — var. excelsa **88**
— — var. pubescens (Corn.) Corn. ex Masamune **90**
— — var. tomentella (Corn.) Corn. ex Masamune **91**
— eximia Miq. 4, 10, 11, 12, 16, 20, **75**, 80, 135
— **fagifolia** Hoogl. 5, 10, 19, **74**, *81
— ferruginea (Baill.) Gilg 4, 5, 9, 10, 12, 15, 19, 30, **47**, *48
— fischeri Merr. 5, 8, 12, 16, 18, **27**
— *floribunda* Hook.f. & Thoms. 118
— *glabra* Martelli 87, 88
— *grandifolia* Wall. ex Hook.f. & Thoms. 134
— *grossulariaefolia* Poir. 136
— *guillotii* Hochr. 31
— *hainanensis* Merr. 118
— *harmandii* Gagnep. 131, 134
— *heterosepala* Fin. & Gagnep. 103
— *hirta* (Ridl.) Diels 52
— hookeri Pierre 10, 15, 16, 20, **85**
— *humilis* Donn 136
— indica L. 4, 6, 10, 15, 16, 17, 20, **108**, 136
— — Auct. 62
— — *var. aurea* (Sm.) O. K. 113, 128, 129, 130
— — *f. elongata* (Miq.) Miq. 109
— ingens Burtt 8, 16, 18, **38**
— **insignis** (A. C. Smith) Hoogl. 9, 16, 18, **44**
— *integra* Thunb. 100
— — Auct. 135
— *kerrii* Craib 125, 126
— *longepetiolata* (Warb.) Diels 52
— luzoniensis (Vidal) Martelli ex Dur. & Jacks. 10, 16, 20, 59, **93**, *95, 103
— — Auct. 57
— *macdonaldi* (F. v. M.) Martelli ex Dur. & Jacks. 52
— *macrocarpa* Ruiz ex Vesque 136
— *macrophylla* Reinw. ex Bl. 136
— — (Laut.) Diels 35, 36
— *madagascariensis* (Poir.) Martelli ex Dur. & Jacks. 31
— *magnicapsula* Pav. ex Vesque 136
— *magnoliaefolia* Martelli 87, 88
— **mansoni** (Gage) Hoogl. 10, 16, 20, **83**
— **marsupialis** Hoogl. 10, 16, 19, **66**, *67
— *mattadensis* Martelli ex Dur. & Jacks. 87
— *mattanensis* Martelli 87, 88
— megalantha Merr. 10, 16, 19, **61**
— *megalophylla* Merr. 28, 30
— *meliosmifolia* Hook.f. & Thoms. 97
— *membranifolia* (A. Gray) Martelli ex Dur. & Jacks. 45
— *micrantha* Martelli 113
— *mindanaensis* Elm. 61
— *minor* (Zoll. & Mor.) Gilg 118
— *misorensis* Martelli 52
— monantha Merr. 10, 16, 20, 59, 96, **102**

— montana Diels 8, 16, 18, 37
— *neoebudica* Guill. 45
— *nicobarica* Kurz ex Parkinson 127
— *oblonga* (Wall. ex Hook.f. & Thoms.) Gilg 87, 90
— obovata (Bl.) Hoogl. 5, 10, 16, 21, **130**
— ochreata (Miq.) Teysm. & Binn. ex Martelli 10, 16, 19, **60**, 68
— — Auct. 66
— *ornata* Wall. 130
— **ovalifolia** Hoogl. 8, 12, 16, 18, *29, 33, 51
— — var. ovalifolia **34**
— — var. **sericea** Hoogl. **34**
— ovata Wall. ex Hook.f. & Thoms. 10, 16, 17, 20, **105**, 130, 134
— papuana Martelli 9, 16, 18, 36, 39, *40, 135
— *papyracea* Merr. 28, 30
— **parkinsonii** Hoogl. 10, 16, 21, **115**, *116
— parviflora Griff. 10, 16, 21, **125**
— — var. **kerrii** (Craib) Hoogl. **126**
— — var. parviflora **126**
— *parvifolia* Martelli 113
— *pauciflora* (Zoll. & Mor.) Gilg 87, 88
— *pedunculata* Schum. & Laut. 52
— pentagyna Roxb. 4, 10, 12, 15, 16, 21, 30, **117**
— — Auct. 109
— — *var. albida* Pierre 118, 122
— — *var. augusta* (Roxb.) Kurz 118
— *var. flavida* Pierre 118, 122
— — *var. indica* Pierre 118, 122
— philippinensis Rolfe 10, 16, 17, 19, **62**
— — var. philippinensis **64**
— — var. pubifolia Merr. **65**
— *pilosa* Roxb. 123, 125
— — Auct. 127
— *procumbens* Labill. 136
— pteropoda (Miq.) Hoogl. 12, 16, 18, **28**, 135
— pulchella (Jack) Gilg 10, 16, 20, **113**
— *pulcherrima* Kurz 128, 129, 134
— quercifolia (White & Francis ex Lane-Poole) Hoogl. 8, 16, 19, **34**
— *racemosa* Buch.-Ham. ex D. Don 136
— *radicans* Hort. ex Link 136
— reifferscheidia Villar 4, 10, 16, 19, **68**
— — *var. rosea* Elm. 69, 70
— *repanda* Roxb. 85, 134
— reticulata King 4, 10, 11, 16, 20, **78**, 134, 135
— — var. **psilocarpella** Hoogl. **79**
— — var. reticulata **79**
— retusa Thunb. 10, 16, 20, **100**
— — *var. integra* (Thunb.) Boerl. 101
— *rhizophora* Boerl. & Koord. ex Koord.-Schum. 80, 135
— *rubescens* Ruiz ex Vesque 136
— **salomonensis** (White) Hoogl. 9, 16, 18, **43**
— scabrella (D. Don) Roxb. ex Wall. 10, 16, 21, **123**
— *scandens* Willd. 135
— schlechteri Diels 8, 16, 19, **35**, 38
— *scortechinii* (King) Ridl. 75
— *secunda* Hunter 87, 90
— serrata Thunb. 8, 12, 14, 16, 18, 25, **25**, 68
— sibuyanensis (Elm.) Merr. 10, 16, 20, **99**
— *speciosa* Thunb. 108, 113
— — (Presl) Gilg 68
— — Auct. 63, 136
— suffruticosa (Griff.) Martelli 10, 16, 17, 19, **70**
— — *var. borneensis* (Ridl.) Ridl. 70
— sumatrana Miq. 10, 16, 20, **97**
— **talaudensis** Hoogl. 10, 16, 19, **59**, *67
— *tetragyna* Lag. ex DC. 136
— *thurifera* Pav. ex Vesque 136
— *tomentella* Martelli 87, 91
— triquetra (Rottb.) Gilg 4, 8, 15, 16, 19, **30**
— turbinata Fin. & Gagnep. 10, 16, 20, **103**, 108
— *turneraeflora* Ker-Gawl. 136
— *volubilis* (Andr.) Vent. 136
Dilleniaceae 6, 7
Dillenieae 7
Dillenioideae 7
Eudillenia Hook.f. & Thoms. 10
Euwormia Hook.f. & Thoms. 10
Exalatae Ridl. 11
Fasciculatae Gilg 10
Grandiflorae Gilg 10
Guttiferales 6
Hibbertia 7
— scandens (Willd.) Dryand. 135, 136
— *volubilis* Andr. 136
— procumbens (Labill.) DC. 136
— grossulariaefolia Salisb. 136
Hibbertieae 7
Lenidia Du Petit-Thouars 4, 6
— *alata* (DC.) Poir. 50
— *dentata* (Thunb.) Poir. 30
— *madagascariensis* Poir. 4, 30
— *triquetra* (Rottb.) Poir. 30
Magnoliaceae 11
Malus rosea malabarica Syalita dicta Pluken. 108
Neowormia Hutch. & Summerh. 4, 6
— *ferruginea* (Baill.) Hutch. & Summerh. 4, 47
Paeonia 7
Parietales 6, 7
Polycarpicae 6, 7

Protodillenia Gilg 10
Reifferscheidia Presl 4, 6, 10
— *speciosa* Presl 4, 68
Sangius Rumph. 25, 26, 113
Saurauia andreana (F. v. M.) Oliver ex F. v. M. 136
Schumacheria 7, 11
Songium Rumph. 25, 26
Syalita Rheed. 3, 4, 108
Ternstroemia racemosa D. Don 136
Tetracera 7
— *borneensis* Auct. non Miq. 93
Tetracereae 7
Tetraceroideae 7
Theales 6
Vormia Adans. 4
Wormia Rottb. 4, 6
— (pro subgen.) 10
— Vahl 4
— *alata* R. Br. ex DC. 49, 51
— *albiflos* Ridl. 22
— *apetala* Gaud. 50
— *artocarpifolia* Baker 31
— *augusta* Steud. 118
— *auriculata* (Martelli) Gilg & Werderm. 51
— *beccariana* (Martelli) Ridl. 21
— — Auct. 22
— *biflora* (A. Gray) Seem. 45
— *blanchardii* (Pierre) Gilg & Werderm. 96
— *bracteata* (Wight) Hook.f. & Thoms. 84
— *burbidgei* Hook.f. 70
— *calothyrsa* (Diels) Gilg & Werderm. 39
— *castaneifolia* Miq. 52
— *coromandelina* Spreng. 118
— *crenata* A. C. Smith 42
— *dentata* (Thunb.) DC. 30
— *excelsa* Jack 15, 86
— — Auct. 70
— — *var. borneensis* Miq. 88
— — *var. pubescens* Corn. 90
— — *var. tomentella* (Martelli) Corn. 91
— — *f. grandifolia* (Miq.) Miq. 87
— *ferruginea* Baill. 47
— *fischeri* (Merr.) Gilg & Werderm. 27
— *floribunda* Steud. 118
— *grandiflora* Miq. ex Hook.f. & Jacks. 87
— *grandifolia* Miq. 87
— *hirta* Ridl. 52
— *ingens* (Burtt) A. C. Smith 38
— *insignis* A. C. Smith 44
— *integra* (Thunb.) Hook.f. & Thoms. 101
— *kunstleri* King 75
— *longepetiolata* Warb. 52
— *luzoniensis* Vidal 93
— *macdonaldi* F. v. M. 52
— *macrophylla* (Laut.) Gilg & Werderm. 35
— — Auct. 39
— *madagascariensis* (Poir.) DC. 30, 136
— — *f. guillotii* (Hochr.) Perrier 31, 32
— — *f. typica* Perrier 31, 32
— *mansoni* Gage 83
— *megalantha* (Merr.) Gilg. & Werderm. 61
— *meliosmifolia* (Hook.f. & Thoms.) King 97
— *membranifolia* (A. Gray) Seem. 45
— *misorensis* (Martelli) Gilg & Werderm. 52
— *mollissima* Boerl. 78, 79
— *montana* (Diels) Gilg & Werderm. 37
— *nitida* A. C. Smith 35
— *oblonga* Wall. ex Hook.f. & Thoms. 87, 90
— *obovata* (Bl.) Spreng. 130
— *ochreata* Miq. 60
— *papuana* (Martelli) Gilg & Werderm. 39
— *papyracea* (Merr.) Gilg & Werderm. 28
— *parviflora* Ridl. 97
— *pauciflora* (Zoll. & Mor.) Koord. & Val. 87
— *pteropoda* Miq. 28
— — Auct. 39
— *pulchella* Jack 113
— *quercifolia* White & Francis ex Lane-Poole 34
— *retusa* (Thunb.) Hook.f. & Thoms. 101
— *revoluta* Teysm. & Binn. 70
— *salomonensis* White 43
— *scabrella* (D. Don) Spreng. 123
— *schlechteri* (Diels) Gilg & Werderm. 35
— *scortechinii* King 75
— *sibuyanensis* Elm. 99
— *subsessilis* Miq. 70, 74
— — *var. borneensis* Ridl. 70, 74
— *suffruticosa* Griff. 70, 74
— *tomentella* (Martelli) Ridl. 87, 91
— *triquetra* Rottb. 4, 6, 30
Wormiopsis Baill. 10

PRELIMINARY ACCOUNT OF PAPUAN NOTHOFAGUS

by

C. G. G. J. VAN STEENIS

(Pre-issued 23. I. 1952).

As early as 1939 I started a study of Papuan Nothofagus, and since 1948 I was entrusted with the elaboration of all the material my colleagues could lay hands on. This work was repeatedly interrupted on account of official duties. Pending the full account of the work in the Journal of the Arnold Arboretum I regret that it seems necessary to safeguard my conclusions as soon as possible.

NOTHOFAGUS Bl.

I. Sect. 1. DECIDUAE, sect. nov. — Arbores vel frutices decidui. Folia plicata. — Typus: *N. betuloides* (Mirb.) Bl.
II. Sect. 2. SEMPERVIRENTES, sect. nov. — Arbores vel frutices sempervirentes. Folia non plicata. — Typus: *N. fusca* (Hook.f.) Oerst.
  1. Subsect. Quadripartitae, subsect. nov. — Cupula 4-partita. — Typus: *N. fusca* (Hook.f.) Oerst.
  2. Subsect. Bipartitae, subsect. nov. — Cupula 2-partita. — Typus: *N. brassi* Steen.
    A. Series Triflorae, ser. nov. — Cupula 3-flora. — Typus: *N. brassi* Steen.
    B. Series Uniflorae, ser. nov. — Cupula 1-flora. — Typus: *N. pullei* Steen.

Series Triflorae Steen.

1. **Nothofagus recurva** n. sp. — Folia ovato-oblonga vel oblongo-elliptica, 4—7 × 2—3 cm, adulta ad 8 × $3^{1}/_{2}$ cm, nervis utrinque 7—9. Cupula c. 10 mm pedunculata, recurvata. — *Typus: Kostermans 2384* (L.).

2. **Nothofagus perryi** n. sp. — Folia ovato-oblonga, $5^{1}/_{2}$—7 × $2^{3}/_{4}$—$3^{1}/_{4}$ cm, margine distincte crenato, nervis utrinque 6—8. Cupula c. 3—6 mm pedunculata, erecta. — *Typus: Brass 5057a* (Arn.).

3. **Nothofagus starkenborghi** n. sp. — Folia oblonga, subcoriacea, c. $2^{1}/_{2}$ × longa quam lata. 3—$5^{1}/_{2}$ × $1^{1}/_{4}$—$2^{1}/_{4}$ cm, nervo mediano supra sulcato non carinato. ♂ Flores 3, sessiles. Cupula 2—3 mm pedunculata, erecto. — *Typus: Brass 11369* (L.).

4. **Nothofagus brassi** n. sp. — Folia elliptico-oblonga, apice subattenuata, $3^{1}/_{2}$—$5^{1}/_{2}$ × $1^{1}/_{2}$—$2^{1}/_{4}$ cm, margine recurvato. ♂ Flores 3, sessiles. Cupula brevipedunculata, erecta. — *Typus: Brass & Versteegh 11115* (L.).

Series Uniflorae Steen.

5. **Nothofagus pullei** n. sp. — Ramuli tomentosi. Folia elliptico-oblonga, coriacea, margine recurvato, $1^{3}/_{4}$—3 × 1—$1^{3}/_{4}$ cm; stipulae per-

sistentiae. ♂ Flores solitarii, erecti. Cupula immatura minuta, 1-lamellata. — *Typus: Pulle 909* (L.).

6. **Nothofagus crenata** n. sp. — Folia plana, subcoriacea, ovato-oblonga, $2^1/_2$—$5 \times 1^1/_2$—2 cm, basi cuneata, apice attenuata, margine leviter crenata. Cupula erecta, c. 5 mm pedunculata, 3-lamellata. Ovarium orbiculare. — *Typus: Brass 11335* (L.).

7. **Nothofagus resinosa** n. sp. — Folia elliptico-oblonga, coriacea, plana, infra resinosa, $4^1/_2$—7×2—4 cm. ♂ Flores solitarii, erecti, subsessiles. ♀ Flores erecti, sessiles. Cupula nulla. — *Typus: Brass 10479* (L.).

8. **Nothofagus pseudoresinosa** n. sp. — Folia elliptico-oblonga, plana, chartacea, infra resinosa, $2^1/_2$—$5 \times 1^1/_4$—$2^1/_2$ cm. Cupula sessilis, flore femineo aequigrandis, 1-lamellata, obovato-oblonga. — *Typus: Clemens 5849* (Arn.).

8a. var. **microphylla** n. var. — Folia elliptico-oblonga, $2^1/_2$—$4 \times 1^1/_2$—2 cm. — *Typus: Kanehira & Hatusima 14052 (14056)* (Arn.).

9. **Nothofagus carri** n. sp. — Folia obovata, plana, coriacea, $2^1/_2$—4×1—$2^1/_2$ cm. ♂ Flores 3, pedunculati, patentes. Cupula immatura pedunculata, erecta, e appendicibus 2 elamellatis liberis constituens. Ovarium ovatum, stylo $1^1/_2$ mm longo. — *Typus: Carr 15028* (L.).

10. **Nothofagus cornuta** n. sp. — Folia late elliptica vel ovata, plana, $2^1/_2$—$4 \times 1^1/_2$—$2^1/_4$ cm. ♀ Flores solitarii, sessiles, oblongi; limbus perianthii e appendicibus 2 constituens. Ovarium bicornutum. Cupula nulla. — *Typus: Eyma 5122* (L.).

11. **Nothofagus bernhardi** n. sp. — Folia oblongo-elliptica, utrinque rotundata, crasse coriacea, margine recurvato, $2^1/_2$—$3^1/_2 \times 1^1/_4$—2 cm. ♂ Flores rubri, erecti. Cupula 2—3-lamellata, angusta. — *Typus: Brass 12453* (L.).

12. **Nothofagus grandis** n. sp. — Ramuli cinerei. Folia coriacea, plana, late elliptica vel elliptico-oblonga, $4^1/_2$—7×2—$4^1/_2$ cm. ♂ Flores 3, pedunculati. Cupula sessiles, erecta, late obovata, 12—13 × 7—10 mm. Nux rhomboidea, 7—10 × $9^1/_2$—10 mm. *Typus: L. S. Smith N. G. F. 1098* (Arn.).

13. **Nothofagus decipiens** n. sp. — Folia elliptico-oblonga, coriacea, $1^3/_4$—$2^3/_4 \times 1$—$1^1/_2$ cm. ♂ Flores 3, pedunculati. Cupula 6—7 mm pedunculata, recurvata, 2—3-lamellata. ♀ Flores orbiculati, 3 mm diam. — *Typus: Brass 12675* (L.).

14. **Nothofagus rubra** n. sp. — Folia ovato-oblonga, margine recurvato, $2^1/_2$—$4 \times 1^1/_2$—3 cm. ♂ Flores 3, erecti, subsessiles. Cupula sessilis, erecto, 1-lamellata. Nux orbicularis, 4 mm diam., stylo $1^1/_2$ mm longo persistente apiculata. — *Typus: Brass & Versteegh 11997* (L.).

15. **Nothofagus eymae** n. sp. — Folia elliptica, utrinque rotundata, coriacea, 2—$3^1/_4 \times 1^1/_4$—$1^3/_4$ cm, margine recurvato. ♂ Flores 3, subsessiles. Cupula sessilis, 2-lamellata, immatura 5—6 mm longa, oblonga. ♀ Flores orbiculares, c. 4 mm diam., stylo brevissimo. — *Typus: Eyma 4800* (L.).

16. **Nothofagus dura** n. sp. — Folia crasse coriacea, ovato-oblonga, margine recurvato, $2^3/_4$—$4^1/_2 \times 1^1/_4$—$2^1/_4$ cm. ♂ Flores 3, sessiles. Cupulo sessilis, 2-lamellata. Nux 5—6 mm diam., suborbicularis. — *Typus: Brass & Versteegh 10443* (L.).

CONCISE REVISION OF THE SARCOSPERMATACEAE

by

H. J. LAM & P. VAN ROYEN

(Rijksherbarium, Leiden)

(Issued 1. IX. 1952)

After the senior writer, together with W. W. Varossieau, had published a revision of this monogeneric family (Blumea III, 1938—'39 and IV, 1941), some more material has been examined by us and, moreover, some new species have been described. Thanks to the courtesy of Prof. F. Gagnepain of Paris, and the Director of the Musée d'Histoire Naturelle, Phanérogamie, we had the opportunity to examine the type specimens of Gagnepain's new species from Indo-China. All with all we felt that a new key and a brief enumeration of the species with the main literature, their synonyms and distribution, might be useful.

SARCOSPERMATACEAE H. J. Lam, Bull. Jard. Bot. Buitenz., sér. III, 7, 1925, 248; Blumea III, 1, 1938, 184.

Sarcosperma Hook. f. in Bentham and Hooker f., Gen. Pl. II, 2, 1876, 655; H. J. Lam & Varossieau, Blumea III, 1, 1938, 185 — 8 species from India and China through the Malay Archipelago to New Guinea.

Remarks: The flowers in the whole genus are remarkably constant and provide few or no differential characters of use in a key. Yet, most of the species seem to be sufficiently distinct on account of vegetative characters.

In a study of the wood-anatomy of *Sarcosperma arboreum* and *S. tonkinense* (= Kurrimia robusta Kurz = *K. pulcherrima* Waller, *Celastracea*), Chesnais (Bull. Mus. Nat. Hist., sér. 2, 16, 6, 1944, 514) points out that on account of the structure of the vascular bundle in the petiole, *Sarcosperma* has to be regarded as representing a separate family. It must, however, be pointed out that *S. tonkinense* is not sarcospermaceous at all, so the results of Chesnais have to be regarded with care.

Key to the species.

1.a. Auricles at the top of the petiole extant (rarely wanting in *S. kachinense*) 2

b. No auricles at the top of the petiole 3

2.a. Young branchlets, inflorescences and lower side of the leaves conspicuously pubescent, more or less glabrescent; leaves light brown when dry; glandular pits in the axils of the secondary nerves rare; petioles densely tomentose, short, usually less than 1 cm long; calyx puberulous; staminodes subulate to narrowly deltoid (*Burma, Siam, Tonkin, SW China, Hainan*)

5. **S. kachinense** (King & Prain) Exell, var. **kachinense**

Var. **simondii** (Gagnep.) H. J. Lam, from Tonkin differs in the glandular pits being less rare, the pubescence of the inflorescences being less dense, the somewhat smaller flowers and the subulate, incurved or lanceolate-linear, keeled staminodes.

b. Branches, inflorescences and leaves entirely glabrous or the inflorescences slightly pubescent; leaves dark brown when dry, pits in or near the axils of the nerves and often also scattered on the lower leaf surface; calyx glabrous; petioles 1—2.5 cm long (*British Malaya through the Malay Archipelago to New Guinea*) 7. **S. paniculatum** (King) Stapf & King

3.a. Leaves glabrous, mostly with glandular pits 4

b. Leaves more or less pubescent underneath and without glandular pits . . 5

4.a. Leaves almost all strictly opposite 6

b. Leaves alternate, only the uppermost sometimes opposite; petioles 1—2.5 cm long; glandular pits in the axils of the uppermost nerves only 7

5.a. Leaves oblong to ovate, 10—25 cm long, 4.5—9.5 cm broad, thin, chartaceous; secondary nerves 8—16; pubescence minute; inflorescences lax; pedicel 0.2—0.4 cm long; ovary 1-celled (*Sumatra*) . . . . 8. **S. uittienii H. J. Lam**

5.b. Leaves lanceolate, 12—16 cm long, 3—4 cm broad, rigid, secondary nerves 10—12, pubescence woolly; inflorescences dense, pedicels shorter than 0.1 cm; ovary 2-celled (*Tonkin*) . . . . 2. **S. angustifolium** Gagn.

6.a. Glandular pits always extant in the axils of the secondary nerves, mostly close to the axis; leaves variable, mostly relatively large, 11—35 cm long and not rarely broad, up to 13 cm; petioles 1.2—3 cm long, secondary nerves 7—13, inflorescences moderately pubescent, up to 18.5 cm long, lateral branches up to 10.5 cm long; calyx tomentose (*India, Burma, Siam, SW. China*) 3. **S. arboreum** Hook. f.

b. Glandular pits, if any, very rare; leaves generally smaller, 5.5—20 cm long, 1.5—5.5 cm wide, relatively narrow; petioles 0.4—1.3 cm long; secondary nerves 6—9; inflorescences glabrous, 3.2—6.8 cm long, branches 1—4.5 cm long; calyx glabrous (*India, SW. China*) . . . . 4. **S. griffithii** Hook. f.

7.a. Leaves mostly obovate, with blunt apex to more or less acutely acuminate, rarely lanceolate; calyx slightly puberulous or glabrous; pedicels 0.1—0.2 cm long; ovary 1-celled (*S. and E. China, Honkong, Hainan*) . 6. **S. laurinum** Hook. f.

b. Leaves lanceolate with acutely acuminate apex; calyx glabrous; ovary 2- or 3-celled (*Annam*) . . . . 1. **S. affine** Gagn.

1. S. affine (*affinis*) Gagn. in Bull. Mus. Nat. Hist. 2, sér. XX, 1948, 293 — Indo-China.

Indo-China — Annam, near Moi Go-oi, Quang-Nam prov., 500 m: *E. Poilane 31432, type specimen* (P), tree, 6—7 m high, 0.40 m diam., flow. buds on 21. 2. 1941, latex white, very sticky.

Remarks: To Gagnepain's description the following may be added: staminodes either subulate or deltoid and keeled and mostly longer than the anthers; stigma 4-lobed; calyx up to 2.5 mm long.

This species seems to be intermediate between *S. laurinum* (leaves not strictly opposite, tertiary nervation inconspicuous, glandular pits in the axils of upper nerves; different by the acutely acuminate top of the leaf, the lanceolate leaves and the longer pedicels), and *S. griffithii* (leafshape and tip; different by its mostly alternate leaves, opposite only near the tips of the branchlets, glandular pits extant and larger pedicels). The species might well represent a hybrid between the two species just mentioned.

In the flowers examined by us the ovary is found to be 2-celled. Gagnepain states that they are either 2- or 3-celled. At any rate, 3-celled ovaries are very rare in this genus (cf. sub *S. griffithii* underneath).

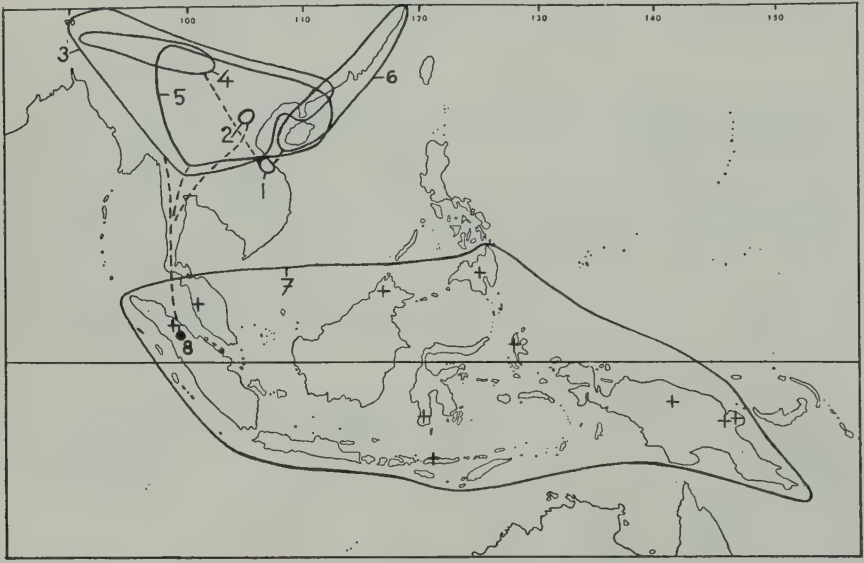
2. S. angustifolium Gagn. in Bull. Mus. Nat. Hist. 2, sér. XX, 1948 294 — Indo-China.

Indo-China — Tonkin-Massif de Mui-bien, near Chobo, 800—900 m: *E. Poilane 13172, type specimen* (P), flow. on 6. 9. 1926.

Remarks: In addition to Gagnepain's description it may be pointed out that the staminodes are sometimes subulate and that the stigma is 4-lobed. The calyx is up to 4 mm long.

Apparently related to *S. uittienii* from Sumatra but quite distinct by its stiff, narrow leaves with fewer nerves (8—12, *S. uittienii* 8—16), the more woolly pubescence of its dense inflorescences, the 2-celled ovary (*S. uittienii* 1-celled) and the ribbon-shaped to subulate staminodes.

3. **S. arboreum** Hook. f. — Lam & Varossieau, Blumea III, 1, 1938, 192; Fletcher, Fl. Siam. Enum. 2, 4, 1938, 363; Lam & Varossieau, Blumea III, 2, 1939, 262; Merrill, Brittonia 4, 1, 1941, 163; Chesnais, Bull. Mus. Hist. Nat., sér. 2, 16, 6, 1944, 514, 1 f. — India, Burma, Siam, China.



Distribution of *Sarcosperma* — 1. *affine*; 2. *angustifolium*; 3. *arboreum*; 4. *griffithii*; 5. *kachinense*; 6. *laurinum*; 7. *paniculatum* (add + in Celebes, on equator, and in Ceram); 8. *uittienii*. Interrupted lines indicate supposed relations.

New records:

China — prov. Yunnan: Lau Tsang Hsien, ravine: *C. W. Wang 76417* (A), tree 6 m high, 20 cm diam., fr. green, May 1936; Shunning Hila: *T. T. Yü 16539* (A), 1900 m, in ravine, forest, tree 13 m high, fr. oblong ovoid, green, June 1938.

Upper Burma — Keng Tung Territory, Meh Len Valley, alt. 660—930 m: *Rock 2178* (NY), 29. 1. 1922 (*specimen not seen*, cf. Merrill).

Remarks: In the description given by Lam (1938), the staminodes are characterized as being subulate; however, deltoid and lanceolate, either of which with or without keel, are found too. The stigmas are sometimes 4-lobed.

4. **S. griffithii** Hook. f. — Lam and Varossieau in Blumea III, 1, 1938, 197—198; Lam and Varossieau, ibid. III, 2, 1939, 262 — *S. cheliense* Hu (ined.) — India, W. China.

New record:

CHINA — Yunnan province, Meng Soong, Dah-meng lung, Che-li Hsien, 1900 m, mixed woods: *C. W. Wang 78276, type specimen of S. cheliense* (A), tree, 9 m, diam. 0.3 m, flow. buds greenish, in Sept. 1933.

Remarks: In Lam's description the ovary is given as being 2-celled but 1- or 3-celled ovaries have been found by us. The staminodes are subulate or lanceolate-linear. The calyx may be slightly puberulous.

According to Hu's manuscript description of *S. cheliense* this specimen (*Wang 78276*) should deserve specific rank. However, in our opinion it is so close to *S. griffithii* as to make a separation from that species very difficult. We therefore prefer to insert it in the last-named species. We cannot find any close relation with *S. laurinum* or *S. arboreum*, as is claimed by Hu.

As to the glandular pits which are mostly absent in *S. griffithii*, *Wang 78276* shows no pits of the usual type, though in some leaves rather large depressions close to the lateral nerves are found. They are about 1 mm across and remotely suggest the nature of glandular pits in other species. The pubescence of the inflorescences seems too slight to form a specific barrier against *S. griffithii* which is mostly almost entirely glabrous in this respect. *Wang 78348* mentioned in Hu's manuscript description was not available to us.

5. **S. kachinense** (King and Prain) Exell, var. **kachinense** in Journ. of Bot. 69, Apr. 1931, 100; Lam and Varossieau in Blumea III, 1, 1938, 188—190; idem in III, 2, 1939, 261; Merrill and Chun in Sunyatsenia 5, 1—3, 1940, 161, f. 20; Merrill in Brittonia 4, 1, 1941, 164, *erroneously quoted as S. kachinense (King and Prantl) Exell*; Chatterji and Raizada, Indian Forester 74, 1948, 390—391, tab. 2 — *Combretum kachinense* King and Prain, Journ. As. Soc. Beng. 69, 2, 1900, 169 — *Sarcosperma kachinense* Cowan, Notes Roy. Bot. Gard. Edinburgh 16, 79, Oct. 1931, 222 — *S. pedunculatum* sensu Merr., Lingnan Sc. Journ. 13, 1934, 66, not of Hemsl. — *S. siamense* Fletcher, Kew Bull. 1937, 380; Fletcher, Fl. Siam. Enum., 2, 4, 1938, 363 — *S. caudatum* Merr., ined. — *S. tomentosum* H. H. Hu (ex comm. E. D. Merrill) — Burma, Siam, China.

New records:

UPPER BURMA — Hkamti plain, alt. 400 m, *Ward 9054* (NY), a small tree in the jungle, 20. 12. 1930 (*specimen not seen by us*, cf. Merrill in Brittonia); ibidem, Lakhimpur district, Deliungmukh, *Bor 18047*, a small to medium-sized tree with milky juice, in true ever-green forest, flowers yellowish, Febr. 1944 (*specimen not seen by us*, cf. Chatterji and Raizada).

Remarks: The staminodes are described by Gagnepain as subulate, but sometimes they are lanceolate-linear or deltoid with a subulate apical part; the stigma is either 4-lobed or capitate.

Var. **simondii** (Gagn.) H. J. Lam, nov. comb. — *S. simondii* Gagn. in Bull. Mus. Nat. Hist. 2, sér. 20, 1948, 294 — Indo-China.

INDO-CHINA — Tonkin, near Long-tcheou: *Simond s. n.* (P), *type specimen of S. simondii*, flowers and fruits.

Remarks: The staminodes are described as subulate by Gagnepain, but sometimes they are lanceolate-linear and keeled. Moreover, some dimensions were found different from those given by him: the styles and calyx are up to 0.3 mm and 0.4 cm long respectively, the staminodes up to

0.15 cm and the anthers up to 0.1 cm. For the differences from the specific type cf. the key.

6. **S. laurinum** (Benth.) Hook. f. — Lam and Varossieau in Blumea III, 1, 1938, 195—197; idem III, 2, 1939, 262 — *Reptonia laurina* Benth., Fl. Hongkong, 1861, 208. — China, Hainan, Hongkong.

Remarks: The staminodes are either subulate or deltoid with a subulate apical part, or triangular to linear.

New record:

HONGKONG — *Weiss 3841,* 15. 1. 1870 (BO, L).

7. **S. paniculatum** (King) Stapf and King, Ic. Pl. 7, 1901, 2690; Lam & Varossieau, Blumea III, 1, 1938, 190—192 and III, 2, 1939, 262 and IV, 2, 1941, 322 — *Bracea paniculata* King, Journ. As. Soc. Bengal 2, 1896, 54 — *Discocalyx macrocarpa* Elmer, Leafl. Ph. Bot. 8, 1915, 2781 — *Apoia macrocarpa* (Elm.) Merr., Phil. Journ. Sc. 17, 1920, 605 — *Sacrosperma breviracemosum* H. J. Lam, Bull. Jard. bot. Buitenz., sér. III, 8, 1926, 21, f. 2 — Malay Peninsula and Sumatra to New Guinea and the Philippine Islands.

New records:

BORNEO — Mt Kinabalu, Kappok, long hill, forest, margin of grass land, alt. c. 500 m: *Clemens 51286* (BM), fr. green Dec.

CELEBES — Manado, Palu, Tomado, alt. 760 m, *Neth. Ind. Forest Service bb 28216* (BO, L), 5. 7. 1939.

CERAM — Wae Bekai, Seakasóle, *P. J. Eyma 2520,* fl. 7. 1. 1938 (BO, L), buds yellow, ovary red.

NEW GUINEA — Idenburg-river, Bernhard-camp, *Brass and Versteegh 13184* (L), fruit red, April 1939; Kani-mountains, in forest: *Schlechter 17245* (B), flowers Jan. 1908.

Remarks: Lam describes the staminodes as acute, but in some cases they are squamiform, obtuse.

8. **S. uittienii** H. J. Lam — Lam and Varossieau in Blumea III, 1, 1938, 194—195 — Sumatra.

Excluded species.

S. pedunculatum (*-a*) Hemsley — Lam and Varossieau in Blumea III, 1, 1938, 198 = Planchonella pedunculata (Hemsl.) H. J. Lam and D. A. Kerpel in Blumea III, 2, 1939, 258, f. 3.

S. tonkinense (*-sis*) H. Lecomte — Lam l. c. 198; Chesnais, l. c. 514 (cf. p. 148 above).

According to Merrill (communication by letter) this species has proved to be Kurrimia robusta Kurz (= *K. pulcherrima* Waller) (*Celastraceae*).

S. ovatifolium Gagnepain l. c. 294.

This is certainly not sarcospermaceous: the leaves are exstipulate, without auricles or pits and different venation and mostly alternate, the inflorescences are terminal; the corolla is sericeous pubescent and there are no staminodes; the ovary is 2-celled, each cell being bi-ovulate. It looks like a *Convolvulacea,* but Dr van Ooststroom tells us that he cannot confirm this suggestion.

Index.

(Numbers indicate the number of the species; synonyms in italics)

Apoia macrocarpa (Elm.) Merr. = 7
Bracea paniculata King = 7
Combretum kachinense King & Prain = 5
Discocalyx macrocarpa Elm. = 7
Reptonia laurina Benth. = 6
Sarcosperma affine Gagn. = 1
  angustifolium Gagn. = 2
  arboreum Hook. f. = 3
  breviracemosum H. J. Lam = 7
  caudatum Merr. = 5
  cheliense Hu = 4
  griffithii Hook. f. = 4
  kachinense Cowan = 5
  kachinense (King & Prain) Exell
    var. kachinense = 5
    var. simondii = 5
  laurinum Hook. f. = 6
  ovatifolium Gagn. = non Sarcosperma
  paniculatum (King) Stapf & King = 7
  pedunculatum s. Merr. = 5
  pedunculatum Hemsley = Planchonella pedunculata (Hemsl.) H. J. Lam & D. A. Kerpel
  siamense Fletcher = 5
  simondii Gagn. = 5
  tomentosum H. H. Hu = 5
  tonkinense H. Lec. = Kurrimia robusta Kurz
  uittienii H. J. Lam = 8

Collectors' numbers.

Bor 18047 (5) — Brass & Versteeg 13184 (7) — Clemens 51286 (7) — Eyma 2520 (7) — N. I. F. S. bb 28216 (7) — Poilane 13172 (2), 31432 (1) — Rock 2178 (3) — Schlechter 17245 (7) — Simond s. n. (5) — Wang 76417 (3), 78276 (4), 78348 (4) — Ward 9054 (5) — Weiss 3841 (6) — Yü 16539 (3).

REVISION OF THE BURSERACEAE OF THE MALAYSIAN AREA IN A WIDER SENSE.

Under this general title the *Burseraceae* of the Malaysian area will be gradually revised. These revisions are to be considered justificative preparations to the definite but concise publication in the "Flora Malesiana", in the same way as the papers by Dr C. A. Backer c.s. (Blumea 1938 — hodie) are elaborate precursors to his "Flora van Java". The *Sapotaceae* will be dealt with in a similar way.

Unless the presence of flowers and/or fruits is mentioned, the specimens quoted are sterile. Months of flowering and fruiting have been designated by roman numerals.

For the abbreviations of herbaria Lanjouw and Stafleu, Index Herbariorum I, 1952, has been followed.

NIFS = Neth. Indian Forestry Survey.

I. PROTIUM Burman f.

by

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(Rijksherbarium, Leiden)

(Issued 1. IX. 1952)

Introduction.

A revision of the species, comprised in the section *Eu-Protium* of the genus *Protium* from the region from Asia to Australia incl., might, in view of the elaborate publications by H. J. Lam (The Burseraceae of the Malay Archipelago and Peninsula etc., Bull. Jard. bot. Buitenzorg, S. 3, 12, 1932, p. 318—324) and J. J. Swart (A Monograph of the genus Protium and some allied genera, Rec. Trav. bot. néerl., 39, 1942, p. 211—446), seem superfluous. However, an examination of the Clemens material from New-Guinea of 1939 and of the type material of the thusfar mysterious *Bursera tonkinensis* Guill. justified the publication of some notes thereon. To these some remarks concerning observations on other species have been added.

I am much indebted to the directors of the following herbaria for the loan of material: the herbarium of the Botanisches Museum, Berlin; the herbarium of the Arnold Arboretum, Jamaica Plain, Mass. (A); the herbarium of the Royal Botanic Gardens, Kew; the herbarium of the Muséum d'Histoire Naturelle, Paris; the herbarium of the Botanical Institute, Wroclaw (BRSL); the "Rijksherbarium", Leiden (L).

Key to the species.

Although in most cases the distinction of the few species seems, at first sight, fairly easy, the composition of a key showed, that several characters are quite variable, not rarely overlapping each other in different species as they are understood in the present paper.

1.a. Flowers 4-merous, rarely some 5-merous flowers in the same specimen. Apex of the leaflets acuminate, acumen 1.1—1.5 cm long and 0.4 cm wide at base. Inflorescences 2.5—6 cm long, $^1/_4$—$^1/_3$ the length of the leaves. Pedicels 0.05—0.1 cm long, ± $^1/_3$ the length of the flowers. (*Palawan*)
3. **P. connarifolium** (Perk.) Merr.

b. Flowers 5-merous, rarely some 4-merous flowers in the same specimen . . 2

2.a. Petiolules usually very short, 0.1—0.7 cm long. Ovary and fruit glabrous. Acumen of the leaflets ± 1—$1^1/_2$ times as long as wide. (*Java to Sumbawa*)
1. **P. javanicum** Burm. f.

b. Petiolules rather long, (0.5—)0.75—3.5 cm long. Ovary and fruit more or less pilose 3

3.a. All parts, especially the inflorescence, densely pilose. Leaves ($1^1/_2$—)$2^1/_2$—$4^1/_2$ (—$5^1/_2$)-jugate. Margin of the leaflets subserrate — especially near the apex — to subentire. Lenticels of the petiolules not conspicuous. (*India, Siam, Indo-China*)
2. **P. serratum** (Wall. ex Colebr.) Engl.

b. Sparsely pilose. Leaves ($1^1/_2$—)$2^1/_2$(—$3^1/_2$)-jugate. Margin of the leaflets entire. Lenticels on the petiolules conspicuous, in most cases transversely elongated, particularly on the rims of the groove. (*N.E. New-Guinea*)
4. **P. schlechteri** (Lauterb.) Leenhouts

1. **Protium javanicum** Burm. f.; Lam, l. c. 322; Swart, l. c. 248; E. Meijer Drees, in Comm. For. Res. Inst. Indonesia, 33, 1951, 43.

LESSER SUNDA ISLANDS — Lombok, Mt. Rindjani, Bajan, alt. 125—225 m, parkland: *Elbert 721* (L) fr. IV; ibid., Sadjang, forest, alt. 500—700 m: *Elbert 812* (L) fr. IV; ibid., Swela, alt. 350—500 m: *Elbert 2036* (L) ster. VI.

Remarks: Meiomery of the ovary was stated in two cases: there were only 3 cells, without any trace of a 4th or 5th (*fig. 5*).

Distribution: Java, Madura, Bawean, Kangean, Bali, Lombok, Sumbawa.

2. **Protium serratum** (Wall. ex Colebr.) Engl.; Lam, l. c. 321; Swart. l. c. 254; Guillaumin in Suppl. Fl. Gén. Indo-Chine, 1, 1946, 682.

Remarks: The specimen *Kerr 20300* (L) showed in one case a small additional leaflet inserted on the node of one of the basal leaflets, such as is frequently found in *Garuga*, but was never before reported in *Protium* (*fig. 1*).

I examined 3 or 4 ovaries; all of these showed 4 well-developed cells. In one case only there was not a trace of a 5th one, in the others the place of the 5th cell was shown by two resiniferous ducts, instead of one, in the mesocarpium between two of the cells; the mesocarpium showed also a stronger development at that spot.

Distribution: India, Burma, Siam, Indo-China.

3. **Protium connarifolium** (Perk.) Merr.; Lam, l. c. 320; Swart, l. c. 258.

Remarks: This species is undoubtedly a quite distinct one. It is easily distinguished from *P. schlechteri* by the long tapering apex of the leaflets, and by the medulla of the branchlets, which is gradually disappearing with a scalariform transitional stage. In *P. schlechteri* the medulla is solid and permanent.

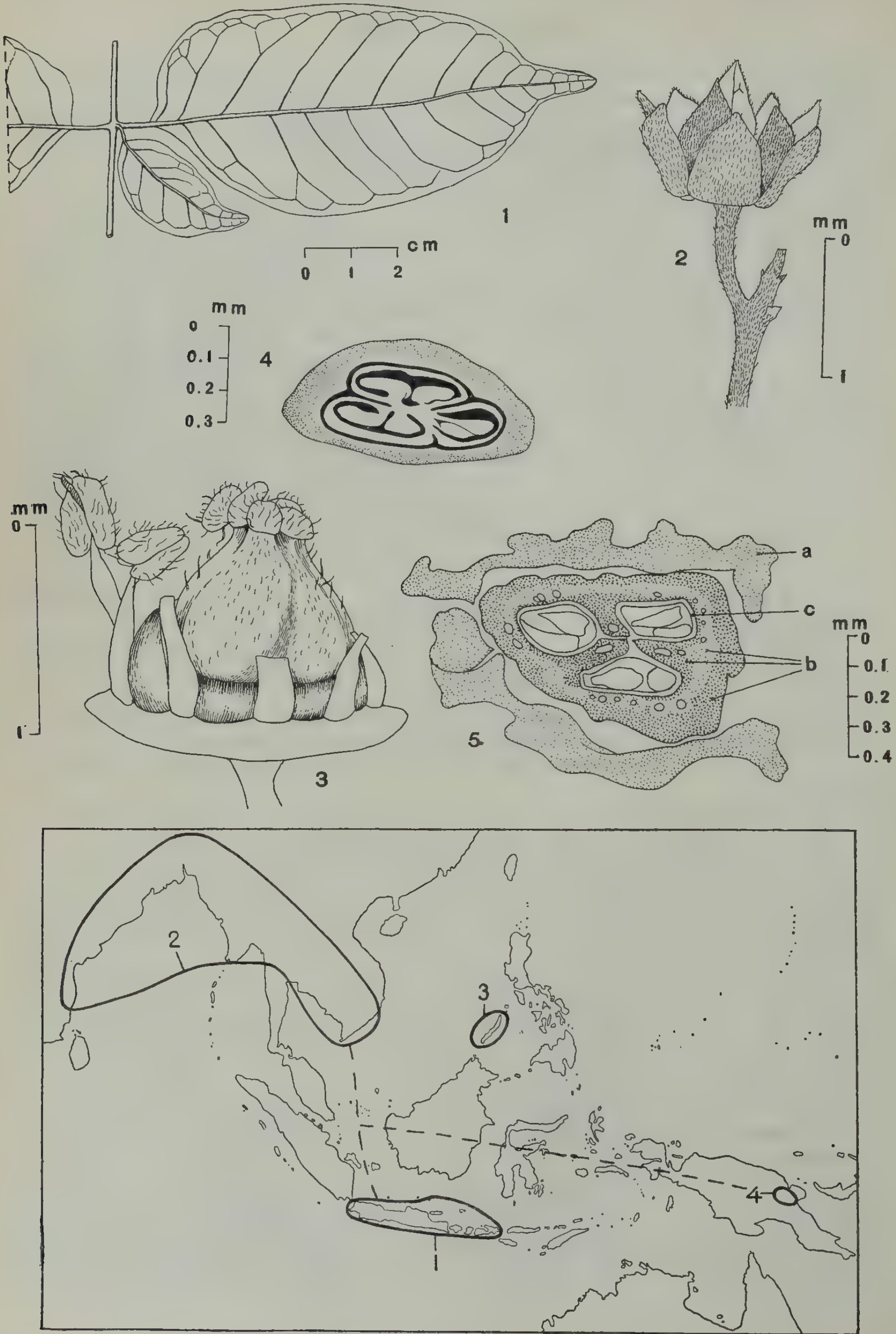

Fig. 1.

Only in one of the 6 flowering specimens examined I found some 5-merous flowers, but most flowers of this specimen were 4-merous.

Distribution: Palawan (Philippines).

4. Protium schlechteri (Lauterb.) Leenhouts nov. comb. — *Santiria schlechteri* Lauterb. in Engl. Bot. Jahrb. 46, 1921, 333; Engl. in Engl. Pr., Nat. Pfl. fam. ed. 2, 19a, 1931, 454 — *Protium connarifolium* auct. non Merr., Lam, l. c. 320—321; Swart, l. c. 260.

As Lauterbach's description was based upon one single specimen and therefore is a very incomplete one, a new diagnosis may follow here:

Large or moderate-sized trees. *Branchlets* 4—5 mm thick, greyish brown to ferruginous, scabrous, youngest parts somewhat pubescent, striate when young; lenticels many, round to ovate, in older parts strongly transversely elongated, fulvous; pith solid and rather hard. *Leaves* (1½—)2½—3½-jugate, 15—23 cm long; *petioles* striate, terete, incrassate at base, brown to purplish-brown when dry, minutely greyishly to fuscously puberulous, to glabrous, (2.4—)3.0—3.2(—4.4) cm; lenticels conspicuous, or, in older parts and especially at base, transversely elongated; *interjugae* (1.6—)2.5—2.8 (—3.2) cm; *petiolules* with conspicuous to almost inconspicuous articulation at either end, strongly canaliculate, i. s. yellowish- to purplish-brown, thinly greyishly to fuscously puberulous, especially in groove, glabrescent in older parts, lenticels large, ovate, soon becoming transversely elongated, at first at basal and apical articulation only, in older leaves the whole petiolule becoming strongly rimose; lateral ones 0.5—1.8 cm, terminal ones (1.5—)2.4(—3.5) cm. *Leaflets* ovate to elliptic-ovate, herbaceous to subcoriaceous, glabrous, dull to nitidulous above, dull beneath, 5.0—11.6 cm long and (2.2—)3.5—4.0(—5.4) cm wide, apex gradually narrowed into a short and broad acumen; acumen rounded to cordate, mucronate, 0.8 cm long and 0.5 cm wide; base cuneate — especially in terminal leaflets — to rounded, somewhat decurrent, more or less unequal in lateral ones; margins entire; midrib grooved above on each side, distinctly more prominent than in *P. connarifolium*, prominent beneath, glabrous or nearly so; secondary nerves 8—10 pairs, prominulous above, prominent beneath; tertiary nerves conspicuous above, prominulous beneath; nerflets inconspicuous above, conspicuous beneath. *Inflorescences* axillary, main ramifications racemose, endings dichasial; ♂ inflorescences much branched, 5—15 cm long, peduncle very short, primary branchlets long (half the length of inflorescence), secondary branchlets 0.5—0.8 cm long, main axes terete and striate, smaller ones angular when dry, sparsely to very sparsely, greyishly to ferruginously, minutely puberulous, bracts triangular, ferruginously puberulous; pedicels 0.1—0.3 cm, as long as flower or longer; ♀ inflorescence less branched, 4—8 cm long, peduncle $^1/_3$—$^1/_2$ the length of inflorescence, secondary branchlets 0.3—0.8 cm long. ♂ *flower* a typical 5-merous *Protium*-flower, cream-coloured (*Clemens 10508*); *calyx* cupuliform, sparsely puberulous, imbricate, lobes triangular, subacuminate, somewhat longer than tube; *petals*

Fig. 1 — *Protium serratum* (Wall. ex Colebr.). Engl., additional leaflet (*Kerr 20300*) — 2. *Bursera tonkinensis* Guill., flower; 3. flower, calyx and corolla removed; 4. ovary, cross-section; (2—4: *Balansa 4034*) — 5. *Protium javanicum* Burm. f., ovary, cross-section (Herb. Kew. 23/6/50-237); a: exocarpium; b: mesocarpium; c. endocarpium.

ovate, valvate near base, induplicate in upper part, apex acute, with incrassate-inflexed apiculum, carnose, thinly ferruginously puberulous; *stamens* 10, ± $1^3/_4$ mm long, anthers more or less basifix, oblong; *disc* annular, glabrous, 0.25—0.5 mm high; *ovary* at base surrounded by the disc, minutely puberulous, ± 1 mm high, distinctly 5-lobed; stigma sessile, 5-lobed. ♀ *flower* not seen. *Fruit* a drupe, obliquely ellipsoid, monopyrenous, 0.7 cm long and 0.5 cm wide, or 2—4-lobed and 2—4-pyrenous, 0.8 cm long and wide, in the latter case sometimes with remainders of a 5th cell, smooth, very sparsely ferruginously puberulous, glabrescent, green when young growing pale brown (*Clemens 10524 bis, 10689*), i. s. pale brown.

N.E. NEW GUINEA — Madang, Kani Mts, alt. 800 m: *Schlechter 16755* (BRSL), fr. XI, *type spec.* of *Santiria Schlechteri* Lauterb.; Morobe, Kajabit, Markham vall., alt. 250—300 m: *Clemens 10508* (A), ♂ VII; ibid., *Clemens 10524bis* (A), fr. VIII; ibid., Kajabit Mission vicinity, near village, planted for shade, alt. 300—350 m: *Clemens 10689* (A), fr. IX; ibid., village: *Clemens 10847* (A), ♂ XI; ibid., grassland, alt. 300 m: *Clemens 10855bis* (A), fr. XI; ibid., *Clemens 10629 K* (A), ♂ IX.

Remarks: Lauterbach described his *Santiria schlechteri* on account of very incomplete material, which made him think that the flower should be 3-merous. The resemblance of the leaves with those of *Santiria apiculata* Benn., a species widely spread from Malaya to Polynesia, seemed to confirm his supposition that the specimen should represent *Santiria*.

On examination of the Berlin material, however, Lam (l. c. 321) found indications that the flower is rather 4-merous. Finding some similarity with *Protium connarifolium* (Perk.) Merr. from the Philippines, he combined the two species under the name of the latter. Later on, Swart (l. c. 260) shared this opinion, concluding that the two are at least closely related.

However, on re-examining the type material, kindly put at our disposal by the Director of the Botanical Institute at Wroclaw (Breslau), showed that the flowers might well be 5-merous. On closer examination yet other differences from *P. connarifolium* (Perk.) Merr. were found, though also our present material is not fully complete. The main differences may be found in the key.

Curiously enough, *P. schlechteri* (Lauterb.) Leenhouts seems to be more closely related to the *serratum-javanicum* group than to *P. connarifolium* (Perk.) Merr., which seems to be rather isolated systematically.

Uses: Fruit eaten by the natives (*Clemens 10689*). Planted for shade (*Clemens 10689*).

Distribution: N.E. New Guinea.

Excluded species.

Protium tonkinense (Guill.) Engl. in Engl. Pr., Nat. Pfl. fam. ed. 2, 19a, 1931, 413; Lam, l. c. 321; Swart, l. c. 391 — *Bursera tonkinensis* Guill. in Rev. gén. bot. 19, 1907, 161; id. in Suppl. Fl. Gén. Indo-Chine, 1, 1946, 682.

We were fortunate enough to study the type and, as far as is known, single specimen of *Bursera tonkinensis* Guill., kindly put at our disposal by the Director of the Muséum d'Histoire Naturelle, Paris. There are two sheets, both from *Balansa (1034)*, and the material is incomplete. The general impression is that of a *Bursera*. Thusfar, however, that genus is only known from tropical America and it seems improbable that it should be represented by a single species in East Asia.

The flowers make the impression to be bisexual: the anthers are well developed in flowers with a fertile ovary. The latter is 3-celled and the cells are biovulate (*fig. 2—4*). Generally speaking, the difference between the development of the androecium and the gynaecium is distinctly less than is found in the Asiatic *Protia*. The perianth is 5-merous and there are 10 stamens.

In addition, a cross-section through the ovary shows a picture very much different from that in *Protium*. The mesocarpium is less strongly developed and there are no traces of resiniferous ducts. The cross-section rather recalled that of the fruit of *Boswellia papyrifera* Hochst. (N.E. Africa; some other species of this genus are found in India), which shows, however, a very different habit. Cross-sections through ovaries of some *Bursera*-species seemed to resemble that of our *Protia* more closely than *Bursera tonkinensis* Guill. does. The above considerations made me exclude the species from *Protium*. Yet, the material does not allow to put it definitely in any other genus. It seems beyond doubt that it is a member of the tribe *Bursereae* and it seems probable that it is related to the American *Bursera* and possibly to the African-Asiatic *Boswellia*. Only full material, and particularly fruits, can lead to a definite conclusion.

Icica? timoriensis DC., Prodr., 2, 1825, 78; Don, Gen. Hist. Diehl. Pl., 2, 1832, 83; Decaisne, Herb. Timorensis, 1835, 149, Swart, l. c. 395 — *Spondias acida* Soland. in Herb. Banks, not of Blume, *nomen nudum* — *Spondias solandri* Benth. in Benth. et Mueller, Fl. Austr., 1, 1863, 492 — *Spondias pleiogyna* Mueller, Fragm. Phytogr. Austr., 4, 1863—'4, 78 — *Pleiogynium solandri* (Benth.) Engl. in DC., Mon. Phan., 4, 1883, 255; F. Manson Bailey, Queensl. Fl., 1, 1899, 324; id., Compr. Cat. Queensl. Pl., 1909, 124; W. D. Francis, Austr. Rain-Forest Trees, 1929, 214; and in most recent litterature.

= **Pleiogynium timoriense** (DC) Leenhouts nov. comb.

As is already mentioned by Swart, l. c., this is no *Protium* and not even a Burseracea. On examination of the specimen in the Herbarium at Geneva, which we were so fortunate as to have got on loan, being either the type or a duplicate of the type, it showed to be an *Anacardiacea*, hitherto known as *Pleiogynium solandri* (Benth.) Engl. As De Candolle's epitheton specificum *timoriensis* is the older one, the name *solandri* had to be rejected.

Protium australasicum (Bailey) Sprague in Kew Bull. 1912, p. 370; *Santiria ? spec.* Swart, l. c. 393.

= **Canarium australasicum** (Bailey) Leenhouts nov. comb.

This species will be discussed in a following paper.

List of collectors' numbers.

Only those numbers are inserted, which have been seen by the present author and are not mentioned by J. J. Swart (1942). The number in parentheses refers to the number of the species in the present paper.

Beccari 2192 (1; cult. Amboina.)
Clemens 10508 (4); 10524bis (4); 10629 K (4); 10689 (4); 10847 (4); 10855bis (4).
Demandt/van Dillewijn 618 (1).
Dorgelo 929 (1); 1793 (1).
Ebalo 428 (3); 601 (3); 630 (3).
Edaño 505 (3); 563 (3); 861 (3).
Elbert 721 (1); 812 (1); 2036 (1); 3560 (1); 3680 (1); 3866 (1); 3932 (1); 3986 (1); 4002 (1).
Herb. Hookerianum s. n. (1).
Hort. Bog. VII D. 69 (2).
Jenkins s. n. (2).
Mochtarno 2 (1).
Neth. Ind. For. Serv. Ja 4315 (1); Ja 4911 (1).
Simons s. n. (2).
Sulit 3726 (3); 3767 (3).
de Voogd 664 (1); 666 (1).
White 8681 (2).
Zollinger 3768 (1).

II. SCUTINANTHE Thwaites

by

P. W. LEENHOUTS
(Rijksherbarium, Leiden)

(Issued 1. IX. 1952)

The present paper, which gives some additions to H. J. Lam, The Burseraceae of the Malay Archipelago and Peninsula (Bull. Jard. bot. Buitenzorg, S. 3, vol. 12, 1932, p. 420), is based on material, belonging to the herbaria of Leiden and Bogor. The genus is restricted to the following 2 Malaysian species, one of which is new to science.

Key to the species.

1.a. Sepals at least half as long, in most cases (nearly) as long as the petals (1.5—2 mm). Young parts and inflorescences densely pubescent. Secondary nerves 8—15, in most cases archingly joined, prominent below.
1. **S. brunnea** Thwaites

b. Sepals much shorter (0.5—1 mm). Young parts and inflorescences much less pubescent. Secondary nerves 4—8, less distinctly arching and less prominent.
2. **S. brevisepala** Leenhouts

Fig. 1. *Scutinanthe.*
a—e: *Sc. brevisepala* Leenhouts. a. branchlet with leaves and male inflorescences; b. cross-section of petiole; c. male flower; d. longitudinal section of male flower; e. stamens from inside. (a—d. *Buwalda 6658*; e: *Rantegau 25*).
f: area of the 2 species; 1. *Sc. brunnea* Thwaites; 2. *Sc. brevisepala* Leenhouts.

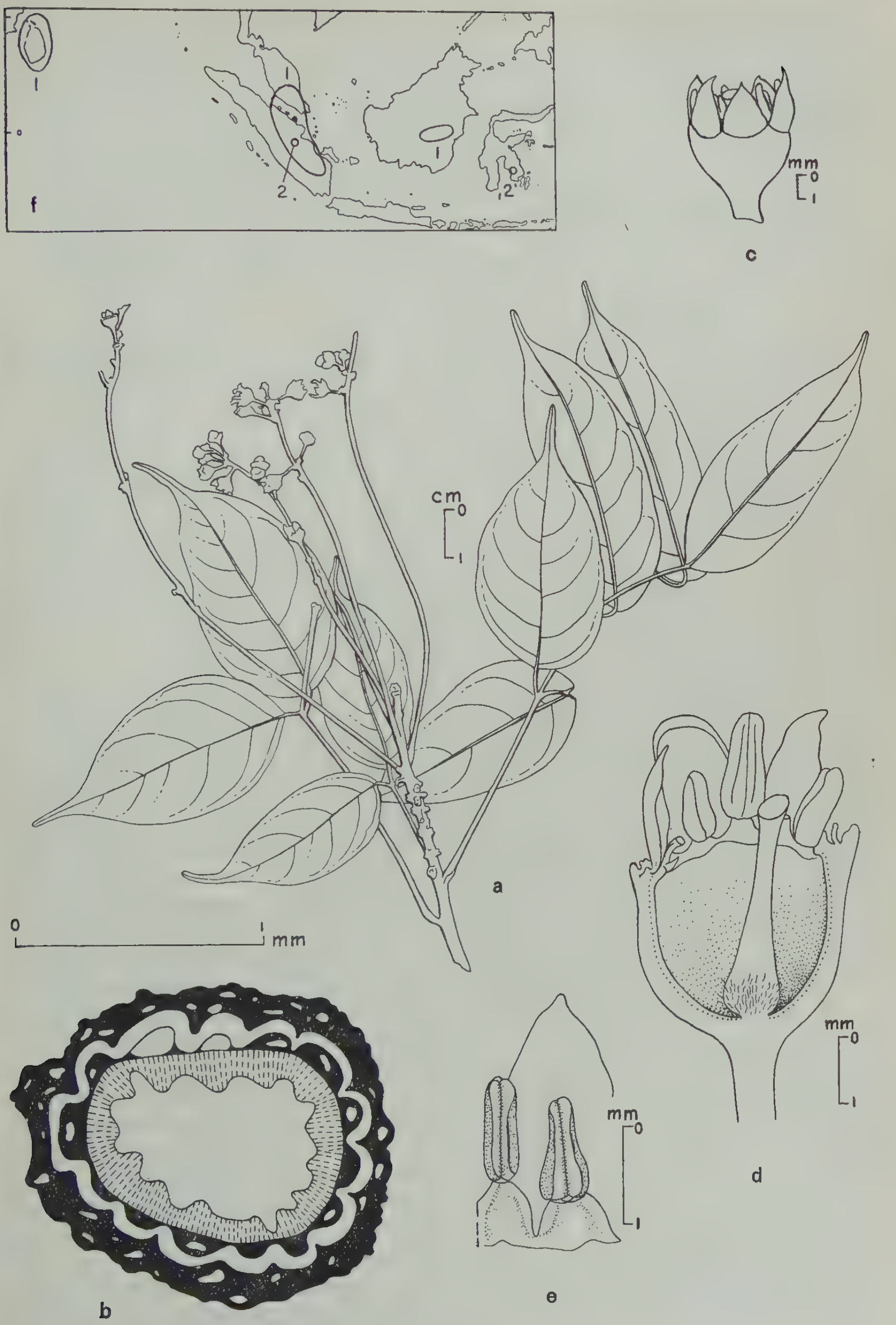

Fig. 1.

1. **Scutinanthe brunnea** Thwaites in Hooker's Journ. Bot. and Kew Misc. 8, 1856, p. 266; Lam, l. c., p. 420.

SUMATRA — Riouw: Indragiri, Kuala Belilas: *Buwalda 6714* (BO, K, L); *NIFS bb. 27572* (BO, L); *NIFS bb. 27598* (BO, L).

BORNEO — Sarawak: Mattang: *Beccari 2598* (FI); SE-Borneo: W-Kutei, Kahala: *NIFS bb. 28381* (BO, L). These are the first records from Borneo.

Distribution: Ceylon, Malay Peninsula, Sumatra, Borneo.

2. **Scutinanthe brevisepala** Leenhouts nov. spec.

Differt a *S. brunnea* Thwaites sepalis multo brevioribus, partis juvenilibus subglabris, nervis lateralibus utrinque 4—8, ovario in floribus masculinis piloso.

Typus: Buwalda 6658 in herb. L.

Medium-sized tree (25 m, f. *Rantegau*). *Branchlets* semiterete, in first year 0.3, in the second 0.5—0.6 cm in diam., i. s. dull reddish-brown, youngest parts scabrous to somewhat hairy, verrucose by many knobby, ovate, ferruginous lenticels and strongly elevated, elliptical, $^3/_4$—1 mm wide leaf-scars; medulla without resiniferous ducts. *Leaves* $1^1/_2$—$4^1/_2$-jugate, 15—25 cm long. *Petioles* semiterete to elliptic, somewhat flattened above, with pronounced lateral ribs, channeled and somewhat swollen near base, (2.2—)4.0(—6.0) cm long, 0.1—0.2 cm thick, glabrous, in some cases in older leaves lenticels, near base and on rims of groove transversely elongated, in other parts small elliptical ferruginously coloured; medulla without resiniferous ducts. *Rhachidal internodes* somewhat swollen near nodes, (0.8—)1.5—2.0(—2.2) cm long, the basal ones longer than the others. *Petiolules* terete, deeply channeled above, in some cases somewhat swollen at either end, especially at basal one, and with some transversely elongated lenticels; the lateral ones 0.25—0.7 cm long, terminal ones 1.1—1.3 cm. *Leaflets* elliptical-ovate, towards top of leaf oblong to lanceolate, 5.0—6.5 cm long and 1.8—2.8 cm wide (*Rantegau 25*: 13.5—16.0 × 5.0—6.0 cm), coriaceous, nitidulous above, dull beneath, glabrous on both surfaces; base semi-inequilateral, subrotundate; margin entire; apex more or less abruptly obtusely acuminate, acumen 0.8—1.2 cm long and 0.2—0.4 cm wide (*Rantegau 25*: 0.7 × 0.5—1.0 cm); costa prominulous above, prominent beneath; secondary nerves 4—8, angle ± 60°, not distinctly arching, visible above, prominulous beneath; tertiary nerves as distinct above as the secondary ones, somewhat prominulous beneath; veinlets (nearly) inconspicuous above, conspicuous to somewhat prominulous beneath. *Inflorescence* ♂: axillary, slender, lax racemes, composed of dense, few-flowered cymes, together pseudoterminal, total length 8—13 cm; peduncle $^4/_5$ of total length; bracts and bracteoles acutely ovate, thinly and shortly ferruginously pubescent, caducous, bracts 1 mm, bracteoles 0.5 mm long, more slender; pedicels terete, 3 mm long. *Flower* ♂: cup-shaped, 0.4 cm high, the receptacle half as high as the whole flower, scabrous outside; *sepals* obtusely deltoid, 3 mm wide and 0.5—1 mm high, scabrous; *petals 5*, not different from those of *S. brunnea*, 2 mm long, green (f. *Buwalda*), scabrous outside; *stamens* 10, somewhat didynamous — episepalous ones longer — inserted on rim of receptacle, filaments slightly connate at base, broad and deltoid, thick and fleshy, glabrous, $^1/_2$—$^3/_4$ mm long, anthers hastate, subdorsifix, 1 mm long, opening with a latero-introrse longitudinal slit; *disc* intrastaminal, adnate to receptacle but for some parts of the incrassate rim, glabrous, fleshy; *pistil* 6—7 mm long, constricted at base; ovary with 2 (or 3?) strongly reduced cells, thickly and shortly ferruginously hairy, globular, tapering into the slender, columnar, glabrous style; style ending in a slightly broadened, thickly papillose stigma, in center somewhat excavate. ♀ *inflorescence,* ♀ *flower* and *fruit* not seen.

SUMATRA — Riouw, Indragiri, between Kuala Belilas and Sungei Berapit: *Buwalda 6658* (type L; dupl. BO, K, SING, A, PNH).

CELEBES — Kolaka Papalia: *Rantegau 25 = NIFS bb. 32508* (BO, L).

Habitat: primary forest, low altitudes.

Flowering time: IV (Sumatra), XI (Celebes).

Native names: mardjelai (Sumatra), kobili (Celebes).

Distribution: Sumatra, Celebes.

III. SCANDENT BURSERACEAE (Dacryodes and Canarium)

by

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(Rijksherbarium, Leiden)

(Issued 1. IX. 1952)

So far as we know, all Burseraceae have been described as shrubs or trees, ranging from small and slender to very lofty.

Some recently discovered material, however, pointed at the possibility that scandent representatives, if perhaps not true lianes, are not entirely lacking in the family. The first specimen intimating this habit to have come to our knowledge was collected by J. & M. S. Clemens on Mt. Kinabalu in British North Borneo, with the emphatic addition "surely scandent". This specimen is almost certainly a Dacryodes in the relationship of *D. rugosa* (Bl.) H. J. Lam, var. *virgata* (Bl.) H. J. Lam. It appeared to deserve specific rank and it has been described by the junior writer underneath as *D. scandens.* Full particulars are give there.

It is probable that some more *Dacryodes* species have a scandent habit, perhaps as a constant, perhaps as an occasional character. It seems well possible that the species in question are, phylogenetically speaking, on their way to become lianes but it is, of course, impossible to predict whether they possess the potentiality to fully acquire the habit of a climber. They certainly have not, thusfar, developed special organs enabling them to climb or facilitating such a function. As far as our present knowledge goes they seem, at least as far as *Dacryodes* is concerned, to be comparatively small woody plants with slender stems, which may keep themselves erect through the support the surrounding vegetation renders them.

Quite the same condition seems to be found in some species of *Canarium.* We owe this knowledge to the scrutiny of Mr P. W. Leenhouts, assistant at the Rijksherbarium who, during his investigation of Pacific Canariums found two examples of this type and who kindly consented, in expectation of his publication, to mention them here. For this we beg to tender him our best thanks.

One of the specimens in question is a representative of *Canarium acutifolium* (DC.) Merr. from Misool (West of New Guinea), coll. *Pleyte 1020.* The field label mentions: common liane, 30 m, 4 cm diam.. Another specimen, collected in the same locality (*Pleyte 1018*) was marked: common tree, 30 m, 30 cm diam.

Two other specimens are from Fiji (Viti Levu) and have been discovered by Mr O. Degener (*nrs. 15159* and *15196*). These have been described (and will be published) as *Canarium harveyi* Seem., var. *scandens* Leenh. Both have emphatically been marked 'liane'. Of a third specimen of *C. harveyi,* var. *scandens* from Fiji (*J. W. Gillespie 2320*) the habit has not been mentioned.

It seems quite probable that this scandent or semi-scandent habit in Burseraceae is more frequent than is indicated by these few examples. Field labels are all too often little detailed and a collector who knows little of the flora he is working in — which certainly does not apply to the three collectors just mentioned — is likely to overlook the imporance of a character in a group he is not familiar with. This is why we should like to draw the attention of collectors, also in other tropical areas, to this exceptional habit in Burseraceae.

Dacryodes scandens A. M. Husson, nov. spec. — *Fig. 1.*

Teste Clemente vere scandens; *ramuli* subgraciles, circiter 0.3—0.4 cm diam., lenticellati, medulla peripheralis multis fasciculis vasorum resiniferorum percursa. *Folia* estipulata, $^1/_2$—$2^1/_2$-jugata, petiolis teretibus glabris, basi et in nodis rachidis distincte sed haud vel vix incrassate articulatis, 5.9—6.3 cm longis, medulla fasciculis vasorum resiniferorum duobus magnis percursa; *foliola* ovato-oblonga, basi rotundata, longiuscule obtuse sensim vel subabrupte acuminata, acumine 1—1.2 cm longo, 0.4—0.5 cm lato, subcoriacea, supra glabra, subtus in nervis minutissime scabridula, in sicco supra fusca, subtus brunnea, integra, 8.5—14 cm longa, 3.5—6.5 cm lata, petiolulis lateralibus 0.5—0.6 cm longis, partibus interjugalibus 2.5—3 cm, terminalibus circa 3 cm longis; costa media utrinque prominens, nervis secundariis 10—13, sub angulo 60°—70° curvato-adscendentibus, utrinque in nervum intramarginalem arcuatim confluentibus, reticulatione utrinque conspicua. *Inflorescentia* (♀ ignota) ♂ glabra terminalis, tota 33 cm longa, ramuli graciles 8—15 cm longi, cymulis ultimis 4-floris brevissimis, bracteae minutissimae squamiformes. *Flores* (♀ ignoti) ♂ glabri, minuti, 0.3 cm diam., pedicelli 2—5 mm longi graciles, ebracteolati. *Calyx* supra medium 3-fidus, circ. 2 mm altus, lobis deltoideis. *Petala* 3, paulo imbricata, oblongo-ovoidea, 3 mm longa, 1.8 mm lata, apice haud incrassata. *Stamina* 6, libera, meta-obdiplostemona subdidynamia, glabra, extra discum minutum pilosum canali centrali suffultum inserta; ovarii rudimentum nullum.

BORNEO — Brit. N. Borneo, Mount Kinabalu, Penibukan, 1200—1500 m: *Clemens 31095,* by trail above camp, on ridge, surely scandent. January 16, 1933, *type specimen* (L).

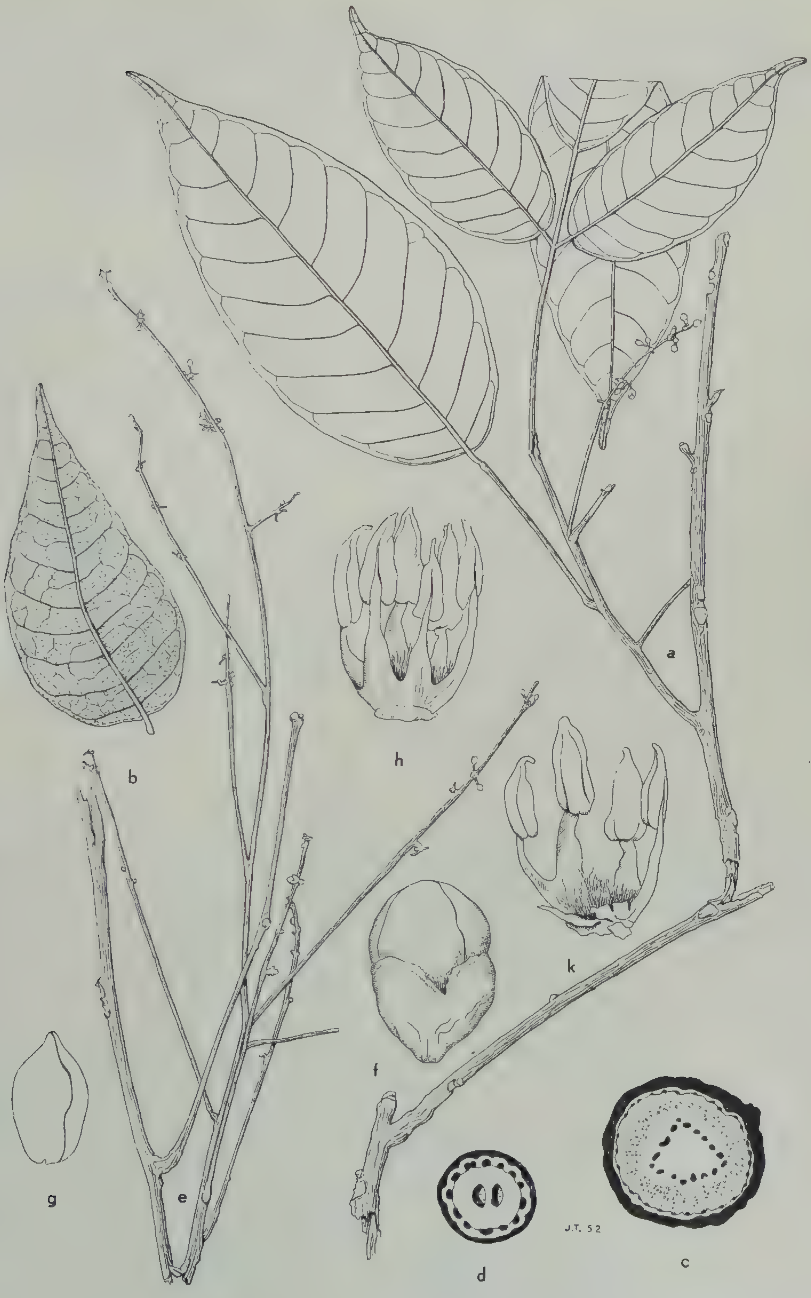

Fig. 1 — *Dacryodes scandens* Husson; a. ♂ flowering branch; b. leaflet with venation; c. cross-section of branchlet; d. ditto of petiole; e. ♂ inflorescences; f. flower bud; g. petal inside; h. androecium; k. ditto, longitudinal section. — from *type specimen.*

Remarks. Although fruits are wanting, there remains little doubt that this is a *Dacryodes*. It is close to *D. rugosa* (Bl.) H. J. Lam, var. *virgata* (Bl.) H. J. Lam. This variety is known from Borneo but not yet from N. Borneo. The type variety is known from British N. Borneo but not yet from Mt. Kinabalu. The difference between the two species are:

	D. scandens	*D. rugosa*, var. *virgata*
habit	scandent	slender to lofty tree
branches	peripheral resiniferous ducts in medulla conspicuous	no such ducts
petioles	two comparatively large resiniferous ducts in medulla	resiniferous ducts in medulla one or some weak ones, or mostly none
leaves	$^1/_2$—$2^1/_2$-jugate, articulations not swollen, base of leaflets rounded, hairs (on midrib only) minute, leaflets 8.5—14 × 3.5—6.5 cm, venation conspicuous but not very prominent	($^1/_2$—) $2^1/_2$—$3^1/_2$ (—$4^1/_2$)-jugate, articulations distinctly swollen, base of leaflets broadly acute, hairs (on midrib and secondary nerves) conspicuous, leaflets 4—23 × 2—10 cm, venation conspicuously prominent.
inflorescence	glabrous, i. s. very dark brown	more or less fulvously pubescent.
♂ flowers	apex of petals not thickened; disk minute, with long erect hairs (this is exceptional in *Dacryodes*, it is well-known in *Canarium* (e. g. *C. multijugum*)	apex of petals somewhat thickened and inflexed; disk conspicuous, glabrous.

In neither there is a rudiment of an ovary though this is mostly well developed in the type variety of *D. rugosa*.

Regarding the habit, the following points may be mentioned in addition to the remarks in the introductory paragraph of this note.

In *D. rugosa*, though not in var. *virgata*, some specimens from the Malay Peninsula have been described on field labels as slender trees, 3—5 m high, and only 5—8 cm in diam.. Other specimens, however, are reported to be 12—25(—35) m high and 25—40(—100) cm in diam.

More or less similar conditions seem to prevail in *D. laxa* (Benn.) H. J. Lam, from the Malay Peninsula, Sumatra and Borneo, which is certainly another relative of *D. scandens* and which is said to be a small tree or a shrub, often not higher than 12—15 m. Only some few specimens are known to attain a greater height. In fact, two specimens of *D. laxa*, var. *forbesii* (Baker f.) H. J. Lam, collected by Clemens (*nrs. 27440* and *27621*, BM, L), both from Mt. Kinabalu at an altitude of 3000 ft, bear the annotation "shrub, scandent?"! These numbers as well as some others from the same collector are also represented in the Rijksherbarium, Leiden, but their duplicate labels give less particulars. It is well possible that some other specimens bear a similar annotation. This may be regarded as an admonition *to give full particulars also on duplicate labels*, instead of merely abstracting them!

Also *D. floribunda* (King) H. J. Lam from the Malay Peninsula is said to be a small tree or a large shrub.

For more particulars about the genus, which is also represented in tropical America and particularly in tropical Africa, we may refer to the senior writer's previous paper in Bull. Jard. bot. Buitenzorg Sér. III, vol. XII, 1932, 334—366.

IV. DACRYODES IN NEW GUINEA

by

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(Rijksherbarium, Leiden)

(Issued 1. IX. 1952)

Thusfar the genus *Dacryodes,* as far as the Australasian area is concerned, was only known to occur in Western Malaysia (including the Philippines), with a centre in the Malay Peninsula, Sumatra and Borneo. Only one, out of 13, species is extending towards Cochin China in the West and the Philippines and N. Celebes in the East and another is known from the Malay Peninsula, British N. Borneo and the Philippines (cf. the senior writer's paper in Bull. Jard. Bot. Buitenzorg, sér. III, Vol. XII, 1932, 334—366).

Thus, *Dacryodes* was so far considered one of the many exclusively or preponderantly west-malaysian genera which do not or hardly cross Wallace's line.

This is why the discovery of a true representative of this genus in central New Guinea and a doubtful one in N.E. New Guinea is a little surprising, since no representatives are known from the interjacent region. Dr Van Steenis tells us that similar cases from other families have recently come to our knowledge, e. g. *Physistelma* (*Asclep.*; Asia-Java, Borneo/New Guinea), *Koompassia* (*Legum.*; Mal.Pen., Sum., Borneo/N. G.), *Cyrtostachys* (*Palmae*; Mal. Pen., Sum., Borneo/N. G. and Carolines), *Nenga* (*Palmae*; Annam, Mal. Pen., Sum./N. G. and Carolines), *Ploiarium* (*Theac.*; S.E. Asia, Mal. Pen., Sum., Borneo/P. Gebeh [W. of N. G.]), *Stephanotis* (*Asclep.*; Afr., Asia, Mal. Pen., Borneo/N. G.), and *Barclaya* (*Nymphaeac.*; Asia, Sum., Mal. Pen., Borneo/N. G.).

There are numerous others, in which the gap is less striking. The explanation may in many cases be a simple lack of knowledge, but it is doubtful whether this is applicable to all cases (cf. Lam, on "anomalous areas", Blumea V^3, 1945, 628—633).

The species has been described underneath by the junior writer.

1. **Dacryodes papuana** A. M. Husson, nov. spec. — *Fig. 1.*

Arbor alta glabra, ramulis subgracilibus lenticellatis laevibus, ca. 0.4—0.6 diam., medulla aresinosa. *Folia* estipulata, $2^1/_2$-jugata (1 fol. videmus), petiolis teretibus, ima basi in parte superiore vix complanatis, 5—$5^1/_2$ cm

longis, rachidis partibus interjugalibus $3^1/_2$—4 cm longis, medulla aresinosa; foliola elliptica, basi subinaequalia rotundata, integra, apice breviter obtuse acuminata, subcoriacea in sicco fusco-olivacea, utrinque nitentia, $8^1/_2$—$11^1/_2$ cm longa, 4—5 cm lata, acumine 0.7—0.9 cm longo et 0.4—0.5 cm lato; petiolulis canaliculatis $1^1/_2$—2.2 cm longis, terminalibus 1.7—3 cm longis; costa subtus valde, supra paulo prominens, nervis secundariis utrinque 7—11, angulo ca. (40°)—50°—(70°) adscendentibus, praecipue prope margines curvatis ibidemque a margine 1—2 mm distantibus, subtus in sicco paulo prominentibus, reticulatione conspicua a nervis secundariis vix distinguente. *Inflorescentiae* floresque ignoti. *Infructescentiae* depauperatae, 11—12 cm longae, laterales, drupae ellipsoideae, apice paulo excentricae, 2.7—3 cm longae, $1^1/_2$ cm diam., pericarpio glabro carnoso, putamen generis characteribus, 0.3 mm crassum, monopyrenum, pedicello 7—10 mm longo, calyce persistente annulare 5 mm diam.

WEST CENTRAL NEW GUINEA — 2 km S.W. of Bernhard Camp, Idenburg River, occasional on slopes, primary forest, 650 m: *Brass & Versteegh 13535* (L, A), tree 30 m high, bark with some colourless resin, April 1939, *type specimen* in Herbarium Leiden.

Remarks. The absence of resiniferous ducts in the medulla of the branchlets is not unusual in the genus but petioles without such ducts are thusfar only known in *D. scandens* (Husson) and *D. rugosa* (Bl.). H. J. Lam.

The nearest allies of the new species seem to be *D. macrocarpa* (King) H. J. Lam (Mal. Peninsula and Sumatra to Luzon) and perhaps *D. elmeri* H. J. Lam (Brit. North Borneo). From the former it differs by the lack of resiniferous vascular bundles in both branchlets and petioles (*D. macrocarpa*: only in petioles) and its smaller fruiting calyx (*D. macr.*: 0.5—0.8 cm); from the latter by the not flattened petioles, the lack of resiniferous bundles, the smaller leaflets (*D. elmeri*: 12—20 × 6—8 cm), the little prominent secondary nerves and the much smaller fruits (*D. elm.*: 4.1—4.7 × 2—2.3 cm).

2. **Dacryodes?** spec.

D. papuana does not seem to be the only *Dacryodes* species in New Guinea. We examined a specimen collected by Clemens at Wareo, Morobe Distr. This looks very much like a *Dacryodes*, but fruits are wanting and the flower buds are too young for examination. We cannot identify the specimen with any burseraceous species known to us (it does not show the *Haplolobus* type, which never has the inflorescences tomentose like this) and, refraining from prematurely naming it, we are giving a preliminary description here:

Tall tree. Branchlets stout (0.6—0.8 cm diam.), medulla without resiniferous ducts, innovations including young inflorescences conspicuously fulvous-tomentose. *Leaves* about $2^1/_2$(—?)-jugate, petiole with rhachis, petiolules and midrib on either side and secondary nerves underneath densely puberulous; petioles flattened above at base, almost terete higher up, medulla with several (4—5) fairly large collateral resiniferous vascular bundles, 4—$8^1/_2$ cm long; leaflets fairly rigid, ovate to oblong, 4.5—14 cm long, 2.8—7.2 cm broad, glabrous except nerves, margins entire, base rounded to broadly acute, sometimes somewhat inequilateral, apex subabruptly bluntly acuminate, acumen 0.3—1 cm long; petiolules 0.4—1.2 cm long; nerves not

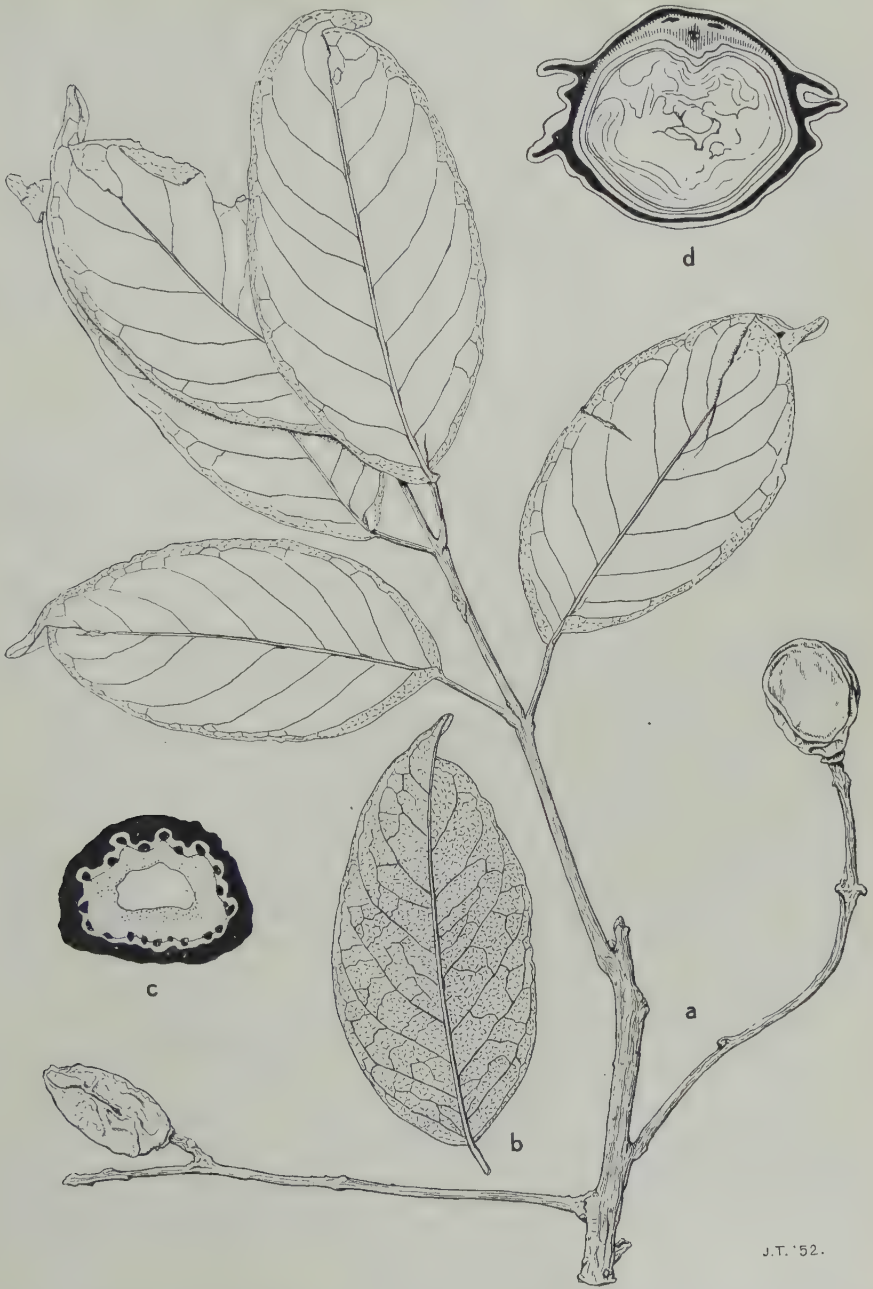

Fig. 1 — *Dacryodes papuana* Husson; a. branchlet with some fruits; b. leaflet showing venation; c. cross-section through petiole; ditto through fruit (pericarp wrinkled by drying process). — from *type specimen*.

prominent below, underneath midrib strongly, secondary nerves conspicuously prominent, reticulation (with faint transverse tertiary nerves) dense, conspicuous on either side (though slightly more so underneath), secondary nerves 6—10, conspicuously curved towards margin, diminishing, not distinctly archingly joined. *Inflorescences* (probably ♂) probably exclusively axillary, paniculate, minutely fulvous tomentose, sometimes branched from the very base, 6—16 cm long (young), many-flowered, flowerbuds in dense clusters with small deltoid bracts; *calyx* densely pubescent, mostly 3-merous, not rarely 4-merous, as is corolla, the lobes deltoid and distinct; *corolla* minutely tomentose outside, petals valvate.

N.E. NEW GUINEA — Morobe Distr., Wareo, base of forest ridge, 750 m alt.: *J. & M. S. Clemens 1837* (A, B), tree, 22—30 m high, nat. n.: halupapa, y. flow. 7. II. 1936.

THE CONVOLVULACEAE OF MALAYSIA, VII [1]

by

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(Rijksherbarium, Leiden)

(Issued 1. IX. 1952)

New and noteworthy species of Argyreia from Malaysia.

In addition to my papers on the genus *Argyreia* in Malaysia I can here give a few descriptions of new species, mainly from Sumatra and Borneo, and some critical notes on others. A revision of the species of Malaysia as a whole, including those of the Malay Peninsula and the Philippine Islands will be published in the near future in Flora Malesiana.

Argyreia linggaensis Van Ooststr., nov. spec.

Volubilis glabra vel in axillis petiolorum, in petiolis et in nervis pilis appressis nonnullis praedita. Ramuli teretes vel striati. Folia (oblonga), ovata vel ovato-elliptica, (10—)12—13(—16) cm longa, (4—)7(—9) cm lata, basi rotundata, truncata vel leviter cordata, apice acuta vel breviter acuminata, mucronulata; nervo mediano nervis lateralibus arcuatis utrinque 5—7 et nervis minoribus reticulatis subtus prominentibus; petiolis (2—)4—6 cm longis, sulcatis. Inflorescentiae axillares, pedunculis rectis vel curvatis, (5—)7 cm longis, subangulatis, apice cymoso-ramosis, 1—3(—5)-floris, ramis primariis 5—10 mm longis, pedicellis 4—5(—7) mm longis. Sepala exteriora 2 ovata, acutiuscula, c. 5 mm longa, interiora 3 paullo longiora, ad 6 mm longa, late ovata obtusa, marginibus tenuioribus. Corolla infundibuliformis, c. 5½ cm longa, glabra, limbo subintegro. Filamenta c. 12 mm supra basin corollae inserta, c. 17 mm longa, glabra, basi breviter pilosa excepta. Ovarium glabrum. Discus annularis, sublobatus.

LINGGA ARCHIPELAGO, P. Singkep, Bt. Tjikalu, roadside, 30 m alt., fl. Aug. 7, 1919, "flowers red", *Bünnemeijer 7331* (*type*, in herb. Bogor.); id., P. Singkep, Kp. Raja, edge of forest, 20 m alt., young flowers Aug. 1, 1919, "twiner", *Bünnemeijer 7099a* (herb. Bogor.).

SUMATRA, East Coast, Siak, Sungei Kelantan, *Ridley s.n.*, 1891 (herb. Singapore).

The description has been drafted after the type specimen, *Bünnemeijer 7331*; the data in parentheses refer to the other specimens mentioned above. The leaves of the specimens from P. Singkep are ovate or ovate-elliptic, those of the plant from Sumatra are oblong.

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[1] Part I in Blumea III, 1 (1938) p. 62—94; part II in Blumea III, 2 (1939) p. 267—371; part III in Blumea III, 3 (1940) p. 481—582; part IV in Blumea V, 2 (1943) p. 339—411; part V in Blumea V, 3 (1945) p. 689—691; part VI in Blumea VI, 2 (1950) p. 337—348.

The species has the glabrous corolla and the form of the leaves in common with *A. nuda* Van Ooststr. (in Blumea V, 3, 1945, p. 686); the minor nervation of the leaves is more distinctly reticulate and much more prominent beneath than in that species; the peduncles are longer, the inner sepals are narrower, broadly ovate (in *A. nuda* elliptic-orbicular); the corolla is longer, c. 5½ cm (in *A. nuda* 3½ cm).

Argyreia nuda Van Ooststr. in Blumea V, 3 (1945) p. 686.

The original specimens, *Bünnemeijer 375* and *436*, were discovered on the slopes of Mount Talakmau, Ophir district, West Coast of Sumatra (both in herb. Bogor.). A third specimen, *Yates 1838*, in herb. New York Bot. Garden, was found in Asahan, Bandar Puluh, East Coast of Sumatra. This specimen has the leaves somewhat broader; they are ovate, 14—17 × 9—12 cm, with 6—7 lateral nerves on either side of the midrib; the petiole has a length of 7—10 cm. The berries are ellipsoid and are only 10—12 mm long. The specimen has originally been identified as being *Kadsura* (*cauliflora Bl.* ?).

Argyreia crispa Van Ooststr., nov. spec. Fig. 1.

Frutex scandens, ramulis petiolis et inflorescentiis dense pilosis, pilis brevibus subpatentibus. Ramuli teretes vel apicem versus subangulati. Folia petiolata, petiolis 2—6 cm longis, basi teretibus, apicem versus plusminusve applanatis; laminis ovatis vel ovato-oblongis, apice acutis vel obtusiusculis, ad basin subcordatis, 8—13 cm longis, 4—8 cm latis, supra glabris, subtus pilosis, praesertim in nervis; nervo mediano supra plano vel paullo impresso, subtus prominente, nervis lateralibus utrinque 5—6 subtus prominulis, nervis minoribus indistinctis. Pedunculi fructiferi teretes 8—22 cm longi, apice corymboso-ramosi, ramis primariis 1—3 cm longis, pedicellis 3—5 mm longis. Bracteae desunt. Sepala sub fructu inaequalia, exteriora 3 ovata obtusa, c. 10 mm longa, extus pilosa intus glabra, margine valde crispata, interiora 2 ovato-oblonga, obtusa, c. 8—9 mm longa, plana vel paullo concava, extus in parte media pilosa, marginibus latis glabris. Bacca ellipsoidea, 12—14 mm longa, purpureo-rubra; semen 1, ellipsoideum.

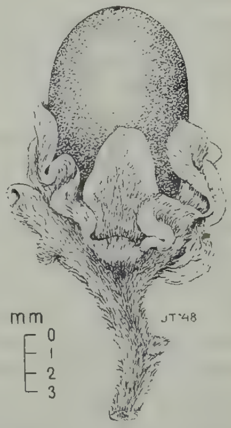

Fig. 1. *Argyreia crispa* Van Ooststr., fruiting calyx.

SUMATRA, Atjeh, along the road from Takigeum to Bireuen; "road to Balique, edges of and in 1st growth jungle. Alt. 3300 ft. Vine climbing. Fruits light purplish red, glossy. Leaves hairy underneath. Flower remnants dry", *W. N. & C. M. Bangham 840*, fr. Jan. 11, 1932, *type* in herb. Kew, duplicates in herb. Arnold Arboretum, New York Botanical Garden, Singapore. Another specimen collected by *W. N. & C. M. Bangham* (n. *1131*), along the Medan-Brastagi road, "kilom. 59—61. Alt. 4100 ft. Virgin jungle mixed with second growth jungle, hilly, mountainous. Vine, climbing. Fruits rose, glossy", with fruits and calyx remnants probably belongs here (herb. Arnold Arboretum, New York Botanical Garden).

Both numbers bear the name *Lettsomia robinsonii* Ridl. [= *Argyreia robinsonii* (Ridley) Van Ooststr.] and are mentioned under that name by

Merrill in Contrib. Arnold Arbor. VIII (1934) p. 145. They are, however, most probably specifically different from it and represent a new species. According to Ridley's description *A. robinsonii* has the sepals oblong, truncate and glabrous; the curious crisped margins of the sepals are not mentioned by that author.

Argyreia pseudorubicunda Van Ooststr., nov. spec.

When preparing my revision of the genus *Argyreia* for the Malaysian region (Blumea V, 1943, p. 352—383) the type of *A. rubicunda* Choisy was unknown to me. Afterwards I received specimens from the Kew herbarium, collected by Griffith in Malacca, which by several authors have been considered to belong to that species, and in my opinion they are right. A description of *A. rubicunda*, as far as the scanty material enables me to give may follow here:

A woody twiner. Stems solid, terete or slightly angular, densely tomentose as are the petioles and the inflorescences with light fulvous hairs. Leaves petiolate; petiole short and stout, up to 5 cm long; blade elliptic or sometimes ovate-elliptic, shortly acuminate at the apex or obtuse with a short acumen, rounded at the base, 8—16 cm long, 4—10 cm broad, thinly coriaceous, glabrous above or slightly hairy on the midrib, short-pilose to tomentose beneath, more densely so on the nerves. Midrib and 7—9 pairs of lateral nerves impressed above, prominent beneath, minor nerves slightly visible above, indistinct beneath. Inflorescences axillary; peduncles long, slender, terete, 8—15 cm, in fruit up to 20 cm long, cymosely branched at the top, several- to many-flowered; the cyme 6—12 cm diam.; pedicels short, thick, 2—4 mm long; bracts small, deciduous. Sepals strongly concave, two outer ones orbicular or slightly broader than long, rounded at the top, 6—7 mm long, densely light fulvous tomentose outside, glabrous inside; third sepal transverse-elliptic, 6 mm long, outside tomentose with one glabrous margin, inside glabrous; two inner sepals transverse-elliptic, 6 mm long, outside densely sericeous with two glabrous margins. Corolla pink (*Prain*), infundibuliform-campanulate, deeply 5-lobed; the lobes ovate-oblong (?) with densely hairy lanceolate midpetaline bands and glabrous margins. Disk annular with slightly undulate margin. Fruit pinkish white (*Griffith*) or purplish red (*Maingay*), at base enclosed by the cupulate to shortly funnel-shaped calyx, ovoid, c. 14 mm long, 8—9 mm broad, 1-seeded; fruiting calyx c. 8 mm high, c. 12—13 mm diam., tomentose outside.

Specimens from Sumatra, formerly identified by the present author as *A. rubicunda* (see Blumea, l. c. p. 371) appear to be different. They belong to a distinct, hitherto unknown species, **A. pseudorubicunda** Van Ooststr., nov. spec.:

Ab Argyreia rubicunda quacum in herbariis et in literatura confusa est, differt habitu minus robusto, sepalis duobus exterioribus ovato-triangularibus, corollae lobis angustioribus, lineari-lanceolatis, extus adpresse sericeis, apice lobulis duobus glabris, indumento minus lanato-tomentoso praesertim in inflorescentia.

Type: Cramer 14, Sumatra, Benkulen, Sukaradja-Kenali, fl. Aug. 27, 1915, in herb. Leiden; another specimen in herb. Bogor.

For a detailed description and an enumeration of the specimens studied by the author see Blumea l. c. p. 371—372. In addition to this description, the differences between *A. rubicunda* and *A. pseudorubicunda* may be listed here:

A. rubicunda Choisy	*A. pseudorubicunda* Choisy
Stems, petioles and inflorescences densely tomentose with light fulvous hairs.	Stems, petioles and inflorescences densely and shortly appressed-pilose.
2 outer sepals strongly concave, ± orbicular or slightly broader than long, 6—7 mm long, up to 8 mm broad; 3 inner sepals transverse-elliptic, 6 mm long and 8½ mm broad.	2 outer sepals not strongly concave, ovate-triangular, obtuse, 5 mm long and 4½—4¾ mm broad; third sepal ± orbicular or somewhat transverse-elliptic, 5—6 mm long and 6—7 mm broad; two inner sepals transverse-elliptic, 5—6½ mm long and 7½—10 mm broad.
Disk annular with slightly undulate margin.	Disk more or less 5-angular, with slightly 5-lobed margin.
Corolla lobes ovate-oblong (?), with lanceolate hairy midpetaline areas and glabrous margins.	Corolla lobes linear-lanceolate, outside hairy with exception of 2 small apical glabrous wings.
Distribution: Malay Peninsula.	Distribution: Sumatra.

Argyreia glabra Choisy in Zoll., Syst. Verz., 2. Hft. (1854) p. 128, 130.

Through the kindness of the Director of the herbarium of Genève, I had the opportunity to study fragments of the type of *A. glabra*. These fragments fully agree with a flowering branch in herb. Bogor., of which the origin is unknown. A description of the species may follow here:

A woody twiner. Stems terete, longitudinally wrinkled, shortly and appressedly pilose, fulvous. Leaves petiolate, petiole 1—1.5 cm long, pilose like the stems; blade ovate, acute at the apex, rounded at the base, 5—8 cm long, 2—4 cm broad, appressed-pilose on both sides with short, rigid hairs, more densely beneath than above; midrib impressed above, prominent beneath, lateral nerves c. 10—11 on either side of the midrib, prominent beneath; minor nervation indistinct. Inflorescences in the upper leafaxils; peduncle angular, densely appressed-pilose with short fulvous hairs as are the branches of it and the pedicels; c. 5 cm long, umbellately cymose, few- to several flowered; primary branches of the cyme c. 1 cm long; pedicels up to 5 mm long; bracts ovate, obtuse, c. 4—5 mm long, densely appressed-pilose. All sepals densely appressed-pilose with fulvous hairs, the 3 exterior ones ovate-elliptic, obtuse, c. 6 mm long, the 2 interior ones ovate, rounded, a little shorter. Corolla 5-fid, the tube at least 10 mm long, glabrous, widened above; the lobes ovate, c. 15 mm long, patent to reflexed, the midpetaline bands densely sericeous. Stamens inserted in the corolla tube, c. 6 mm above its base; filaments filiform, dilated and densely pilose at their base, c. 14 mm long. Style filiform, glabrous; ovary glabrous, 2-celled, disk annular with slightly undulate margin, c. ¾ mm high.

A. glabra was originally described from the island of Lombok, with *Zollinger 985* from Labuan Tring as the type. Specimens from Sumatra, which I formerly supposed to be identic (see my paper in Blumea V, 1943, p. 373) appear to be different. They agree with the type of *Lettsomia parviflora* Ridley [*Argyreia parviflora* (Ridley) Van Ooststr. in Blumea, l. c. p. 382], and the description given in my paper on p. 373 under "*A. glabra*" refers to *A. parviflora*. The two species mainly differ in the following characters:

A. parviflora (Ridley) Van Ooststr.	*A. glabra* Choisy
Stems, petioles and leaves glabrous or nearly so.	Stems, petioles and leaves appressed-pilose.
Lateral nerves 5—8.	Lateral nerves 10—11.
Minor nerves parallel, distinctly visible beneath.	Minor nerves indistinct beneath.
Pedicels 5—9 mm long.	Pedicels up to 5 mm long.
Bracts linear, sparsely pilose, lower ones c. 12 mm long.	Bracts ovate, densely pilose, c. 4—5 mm long.
Sepals sparsely pilose with very short hairs, the inner ones with glabrous margins.	Sepals densely pilose with longer hairs; no glabrous margins.
Outer sepals ovate-triangular, c. 5 mm long.	Outer sepals ovate-elliptic, c. 6 mm long.
Inner sepals orbicular to transverse-elliptic, c. 6—6.5 mm long.	Inner sepals ovate, c. 5.5 mm long.
Corolla tube 5—6 mm long.	Corolla tube c. 10 mm long.
Corolla lobes c. 12—13 mm long.	Corolla lobes c. 15 mm long.
Filaments sparsely pilose at base.	Filaments densely pilose at base.

Argyreia erinacea Van Ooststr. in Blumea V. 2 (1943) p. 374.

The type of *A. erinacea*, *Clemens 30401*, in herb. Bogor., was found in British North Borneo, on Mt. Kinabalu, Tenompok, at 5000 ft. elev.; a second specimen *Clemens 26635*, in herb. Bogor., near the same locality. The specimens were collected with young flowers and with fruits, respectively in Febr. 1932 and in Sept. 1931. *Carr, Singapore Field no. 26718*, in herb. Singapore, also from Mt. Kinabalu, Menetendok river, c. 2800 ft. alt., flowering March 23, 1933, "calyx green; corolla segments purple with white apex; stamens white, base purple", seems to be identic, though there are some points of difference, mainly as to the form of the leaves. These are narrower than in the type, ovate to ovate-lanceolate, rounded at the base and gradually attenuate towards an acute mucronulate apex; they measure 7—9 × 3—4 cm; the longest peduncles are up to 10 cm, and the pedicels up to 3 mm long. The corolla of which only a not fully developed one was available for study in the original material could be examined in the *Carr* specimen: the tube is 6 mm long and glabrous, the lobes are ovate, c. 17 mm long and c. 11 mm broad and show a densely hairy midpetaline band and glabrous margins.

Argyreia discolor Van Ooststr., nov. spec.

Frutex scandens, ramulis teretibus, dense subadpresse pilosis, pilis brevibus fulvis. Folia petiolata, petiolis 2—2.5 cm longis, supra longitudinaliter sulcatis, ut ramuli pilosis; laminis ovatis, apicem subobtusum versus attenuatis basi subcordatis, 6—8 cm longis, 3—5 cm latis, subcoriaceis, supra viridis glabris vel in nervo mediano impresso pilis strigillosis nonnullis praeditis, subtus purpureis sparse breviter pilosis, in nervo mediano prominente et in nervis lateralibus utrinque 6—7 densius pilosis. Inflorescentiae axillares apice congeste umbellato-cymosae, pedunculis 4—7 cm longis, ut cymae ramuli, pedicelli et bracteae minutae dense breviter fulvo-pilosis; cymae ramulis primariis ad 10 mm longis, angulosis, ramulis sequentibus brevioribus, pedicellis 1—3 mm longis. Sepala dua exteriora late ovato-triangularia obtusa, c. 3.5 mm longa, externe dense subadpresse bre-

viter pilosa, interne glabra; sepalum tertium orbiculare vel transverso-ellipticum apice rotundatum, c. 4 mm longum, externe margine uno latere excepto dense breviter pilosum, interne glabrum; sepala dua interiora orbicularia vel transverso-elliptica externe marginibus lateralibus latis exceptis dense breviterque pilosa, interne glabra. Corolla 5-partita, tubo c. 6 mm longo externe glabro, lobis ovato-oblongis obtusis ad c. 17 mm longis, fasciis mesopetalis externe sericeis marginibus glabris. Filamenta ad orem tubi inserta, c. 13 mm longa glabra, basi incrassata. Ovarium 2-loculare glabrum; stylus c. 18 mm longus, glaber; discus 5-lobatus, c. 1 mm altus.

BORNEO: British North Borneo, Tenompok, c. 5000 ft. "Climber. Leaves green above, purple with paler nerves beneath. Calyx purple, densely silvery hairy outside. Corolla purple, tipped paler, densely silvery hairy outside". *C. E. Carr, Singapore Field no. 26872,* fl. April 5, 1933, *type* in herb. Singapore.

This species is very closely related to *A. erinacea* Van Ooststr. from which it differs is the much less strigillose indument on the branches, petioles, peduncles, pedicels and sepals. The sepals are smaller and of a purple colour and densely silvery hairy outside with much shorter and less rigid hairs. The leaves are green above and purple beneath with paler nerves. The corolla is purple, paler tipped, and the midpetaline bands are densely silvery hairy outside.

Argyreia congesta Van Ooststr., nov. spec. Fig. 2, *d—f*.

Argyreiae osyrensis (fig. 2, *a—c*) valde similis quoad formam inflorescentiae, bractearum et sepalorum; differt forma et magnitudine corollae tubo glabro 5 mm longo, lobis linearibus multo longioribus et basi filamentorum glabra.

BORNEO, British North Borneo, Bettotan near Sandakan, "climber, fls. pink, tips white", *C. Boden-Kloss, Singapore Field no. 19010,* fl. July 28, 1927, *type* in herb. Singapore; idem, *C. Boden-Kloss, Singapore Field no. 19125,* fl. Aug. 15, 1927, herb. Singapore; herb. Univ. Calif. A duplicate specimen of no. *19010* in the herb. of the New York Botanical Garden, is labeled Bettotan River, near Sandakan, fl. July 27, 1927; so is a specimen in herb. Univ. Calif.

A woody twiner. Stems terete, densely appressed-pilose to tomentose, with short fulvous hairs. Leaves petiolate; petiole 3—4(—8) cm long, pilose like the stems, grooved; limb narrowly ovate or ovate, attenuate towards the acute or acuminate apex, rounded at the base, 8—14(—17) cm long, 3.5—8(—9) cm broad, the lower surface densely appressed-pilose with straight or slightly curved hairs, or almost tomentose in youth; the upper surface less densely hairy with more rigid hairs; hairs fulvous, with a thickened base; midrib and 8—10 pairs of lateral nerves distinctly visible on both sides. Peduncles axillary, terete, rather slender, 4—10 cm long, densely pilose like the stems; flowers in a small dense, more or less capitate cyme; bracts subpersistent, broadly obovate, broadly rounded to truncate at the top, c. 10—12 mm long, densely appressed-pilose outside, glabrous inside; branches of the cyme short, pedicels shorter than the sepals, 2—4 mm long. Sepals concave, elliptic-oblong, obtuse; two exterior ones c. 8 mm long, outside pilose like the bracts, inside glabrous, third sepal slightly oblique, c. 7 mm long, outside pilose, with one glabrous margin; two interior sepals c. 6.5 mm long, nearly glabrous. Corolla deeply 5-fid, pink, the lobes with

white tips; tube c. 5 mm long, glabrous; lobes linear, c. 17 mm long, 2—2.5 mm broad, densely hairy outside and with 2 glabrous lobules at their top. Filaments inserted at the mouth of the tube, glabrous, c. 12 mm long.

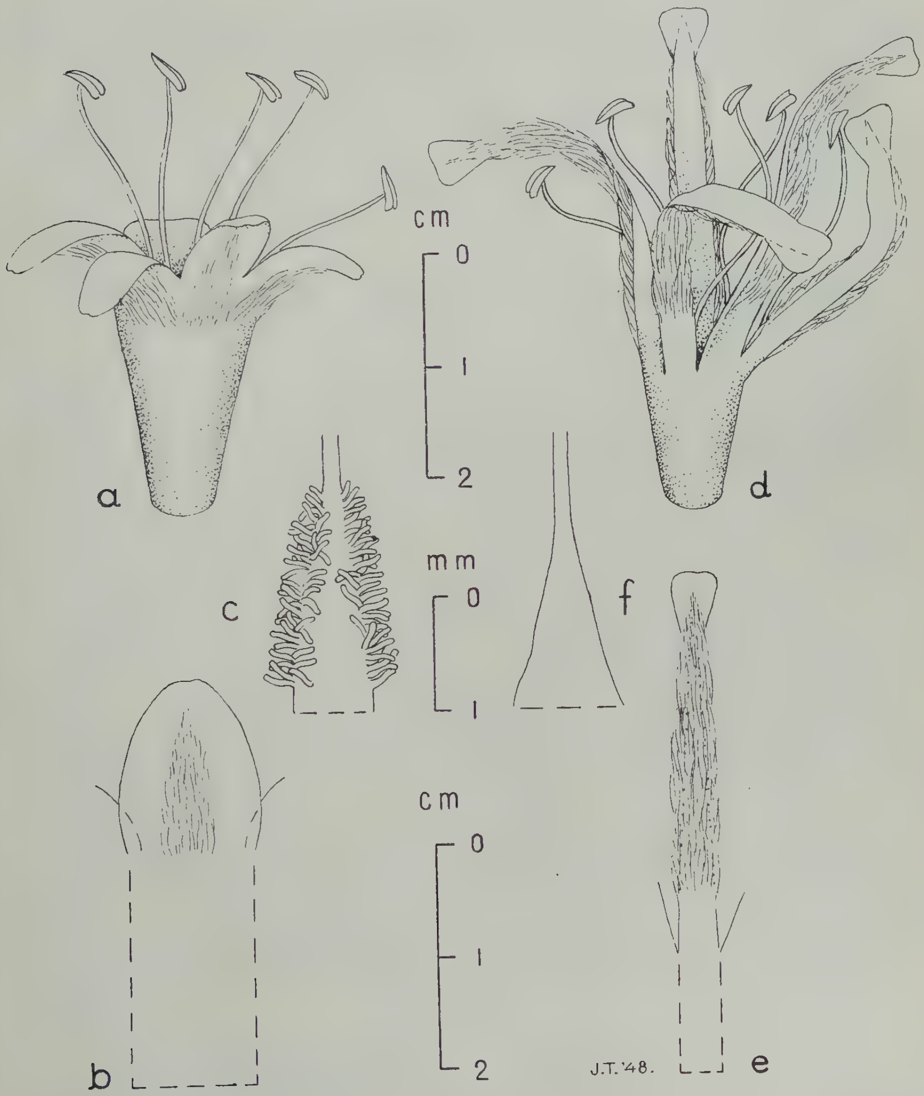

Fig. 2. *a—c*: *Argyreia osyrensis* (Roth) Choisy, *a*: corolla; *b*: corolla lobe; *c*: base of filament; *d—f*: *Argyreia congesta* Van Ooststr., *d*: corolla; *e*: corolla lobe; *f*: base of filament.

Disc low, annular, undulate at the margin. Ovary 2-celled, glabrous. Style glabrous, c. 16 mm long.

Through the kindness of the Director of the Royal Botanic Gardens, Kew, I was enabled to study some of the types of *Lettsomia* species from Siam, described by Kerr in Kew Bulletin no. 1, 1941, which led to make the following new combinations:

Argyreia brachypoda (Kerr) Van Ooststr., nov. comb. — *Lettsomia brachypoda* Kerr in Kew Bull. no. 1, 1941, p. 13.

Type: Put 2190, Siam, Korat, Hui Taleng.

Argyreia breviscapa (Kerr) Van Ooststr., nov. comb. — *Lettsomia breviscapa* Kerr, l. c. p. 13.

Type: Put 4045, Siam, Nakawn Sawan, Hua Wai.

Argyreia calcicola (Kerr) Van Ooststr., nov. comb. — *Lettsomia calcicola* Kerr, l. c. p. 14.

Type: Kerr 19658, Siam, Kanburi, Kao Tawng.

Argyreia roseopurpurea (Kerr) Van Ooststr., nov. comb. — *Lettsomia roseopurpurea* Kerr, l. c. p. 15.

Type: Kerr 11531, Siam, Chumpawn, Kao Tong.

Another new combination is:

Argyreia sikkimensis (Clarke) Van Ooststr., nov. comb. — *Lettsomia sikkimensis* C. B. Clarke in Hook. f., Fl. Brit. Ind. IV, 1883, p. 194.

Type: Clarke, Sikkim, Pomong.

THE CONVOLVULACEAE OF MALAYSIA, VIII[1]

by

R. D. HOOGLAND

(Flora Malesiana, Leyden)

(Issued 1. IX. 1952)

The genus Argyreia in the Malay Peninsula.

Dr Van Ooststroom's revision of the genus *Argyreia* in this series (Blumea V, 2, 1943, p. 352) did not include the collections from the Philippines and the Malay Peninsula. The species from the Philippines have been treated later on by Van Ooststroom (Blumea VI, 2, 1950, p. 337), whereas further additions were given in Blumea V, 3, 1945, p. 686 and Blumea VII, 1, 1952, p. 170. The representatives from the Malay Peninsula remained uninvestigated so far.

The present paper should be considered an addition to Van Ooststroom's papers. Consequently I have not repeated the lists of literature, descriptions, or remarks, unless important additions or changes were necessary.

Several of the species occurring in the Malay Peninsula are endemic, often with local distribution in the Peninsula. Others are found from Bengal to Java, are confined to Sumatra and the Malay Peninsula or to the southern part of the Peninsula and the Riouw and Lingga Archipelagoes; none of the species has been found in Borneo. *Argyreia nervosa* (Burm. f.) Bojer, like in the Malay Islands, is only cultivated in the Malay Peninsula.

The present author is greatly indebted to Dr Van Ooststroom for his valuable help and to the directors and curators of the following herbaria for the loan of specimens: Herbarium Bogoriense, Bogor, Java (BZ), Erbario del Instituto Botanico dell' Università, Firenze (FI), Herbarium, Royal Botanic Gardens, Kew (K), Rijksherbarium, Leyden (L), and Herbarium of the Botanic Garden, Singapore (SING).

Key to the species.

1a. Limb of corolla shallowly lobed or nearly entire 2
b. Limb of corolla distinctly 5-lobed to 5-parted 10
2a. Bracts caducous, small or rarely large, occasionally a casual foliaceous persistent bract in the cyme; cymes mostly lax 3
b. Bracts persistent, rarely some of the lower ones caducous, large; cymes capitate or subcapitate 7
3a. Leafbase deeply cordate. Leaves densely white-tomentose beneath 2. **A. nervosa**

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[1] I—VII by S. J. van Ooststroom, VII in this number, p. 170—177.

b. Leafbase rounded. Tomentum beneath, if present, yellowish 4

4a. Sepals narrowly lanceolate, acute, patently hirsute . . . . **4. A. adpressa**

b. Sepals oblong, ovate, or elliptic, obtuse, never patently hirsute 5

5a. Peduncle shorter or slightly longer than the petiole. Corolla ca 5—6½ cm high **1. A. mollis**

b. Peduncle at least twice as long as the petiole. Corolla ca 2½—3½ cm high . 6

6a. Sepals all broadly ovate, at least the 2 outer ones sparsely appressed-hirsute outside. Peduncles slender . . . . **3. A. penangiana**

b. Two outer sepals broadly ovate, two inner ones transverse-elliptic, densely short-hirsute outside. Peduncles stout . . . . **5. A. scortechinii**

7a. Sepals with long, hirsute acumen, the latter at least as long as the blade of the sepal . . . . **9. A. maingayi**

b. Sepals at the apex obtuse or shortly acuminate 8

8a. Outer bracts transverse-elliptic. Peduncles slender . . **6. A. sphaerocephala**

b. Outer bracts elliptic to narrowly lanceolate. Peduncles rather stout . . . 9

9a. Leaves distinctly cordate at the base, rather densely to densely strigose-hirsute above . . . . **7. A. capitata**

b. Leaves obtuse to rounded, rarely slightly cordate at the base, glabrous to sparsely strigose-hirsute above . . . . **8. A. ridleyi**

10a. Two outer sepals ovate or orbicular, two inner ones transverse-elliptic . . 11

b. All sepals ovate 13

11a. Two outer sepals orbicular, 6—7 mm long, densely tomentose outside; two inner ones transverse-elliptic, densely sericeous except the glabrous lateral margins outside . . . . **10. A. rubicunda**

b. Two outer sepals broadly ovate, up to 5 mm long, appressed-hirsute outside; two inner ones transverse-elliptic, glabrous or sparsely hirsute outside . . . 12

12a. Corolla 15—18 mm high with ca 5 mm deep incisions; filaments glabrous **11. A. kunstleri**

b. Corolla 20—25 mm high with ca 10 mm deep incisions; filaments glandular-hairy at the base . . . . **13. A. reticulata** *var.* **microcalyx**

13a. Base of the stamens glabrous . . . . **12. A. ooststroomii**

b. Base of the stamens with glandular hairs 14

14a. Leaves sparsely strigose beneath. Sepals rather sparsely strigose outside **13. A. reticulata** *var.* **reticulata**

b. Leaves densely light yellowish sericeous beneath. Sepals densely sericeously hirsute outside . . . . **14. A. corneri**

1. Argyreia mollis (Burm. f. 1768) Choisy 1833; Van Ooststr., Blumea 5, 1943, p. 357. — *Argyreia obtusifolia* Auct. non Lour. (Fl. Cochinch., 1790, p. 134); Prain, J. As. Soc. Beng. 74, 2, 1906, p. 320; Ridl., Fl. Mal. Pen. 2, 1923, p. 449; Henders., J. Mal. Br. R. A. S. 17, 1939, p. 59. — *Argyreia championi* Auct. non Benth. (Fl. Hongkong., 1861, p. 236); Prain, J. As. Soc. Beng. 63, 2, 1894, p. 89. — ? *Argyreia obtecta* Clarke, Fl. Br. Ind. 4, 1883, p. 186. — *Lettsomia argentea* Ridl., J. Fed. Mal. St. Mus. 7, 1916, p. 47.

PENINSULAR SIAM, La Tang Si, *Annandale SF 1694*, fl. & fr. Jan. 1916 (SING). MALAY PENINSULA, without locality, *Scortechini s. n.*, fr. (SING); Perlis, Bukit Kentri, *Henderson SF 22937*, fl. & fr. Nov. 1929 (K, SING); Kedah, Alor Sta, *Ridley 15191*, fr. Feb. 1910 (K, SING); Kedah Peak, *Robinson & Kloss 6138*, fr. Dec. 1915 (K, type of *Lettsomia argentea* Ridl., SING); Langkawi Islands, Langkawi, *Curtis 2582*, fl. Sept. 1890 (SING); small islands, *Curtis = 2582*, fl. Nov. 1901 (SING); P. Timun, *Henderson SF 29108*, fl. Nov. 1934 (BZ, K, SING); Langkawi, near Sanatorium, *Nauen SF 37953*, fl. Nov. 1941 (SING).

Habitat: on limestone rocks near the sea, and on heath edge; from sea-level to 1000 m.

Remarks: 1. The original description of *Argyreia obtusifolia* Lour. as well as that of *Argyreia championi* Benth. are insufficient to decide about the respective identities. In both cases, however, in the generic description the corolla is given as deeply 5-lobed, which is not the case in the present species. The specimens cited under these names from the Malay Peninsula certainly belong to the present species.

2. *Argyreia obtecta* Clarke was described from Tavoy, Amherst, Mergui, and Tenasserim; the name was cited by Prain (1894) as a synonym under *Argyreia championi* Benth.. I have seen no original material. A specimen from S. Andaman, present in the Leyden herbarium under this name, quite agrees with *Argyreia mollis* from the Malay Islands, as well as a specimen of Vesterdal from Siam (Chantaboon) in the Singapore herbarium. The area of the species thus would include Siam, Lower Burma, the Andaman Islands, the Malay Peninsula, Sumatra, Java, and Bali.

3. In most specimens from the Malay Peninsula the leaves are relatively narrower than in those from the Malay Islands.

2. Argyreia nervosa (Burm. f. 1768) Bojer 1837; Van Ooststr., Blumea 5, 1943, p. 364.

MALAY PENINSULA, Pulau Penang, Botanic Garden, cultivated, *Curtis s. n.*, fl. June 1900 (SING); Scotland Road, *Ewart s. n.*, fl. Aug. 1938 (SING); Singapore, Botanic Garden, *Furtado s. n.*, veg. Sept. 1927 (SING), fl. Oct. 1929 (SING), *Holttum s. n.*, veg. July 1936 (SING).

3. Argyreia penangiana (Choisy) Boerl., Handl. Fl. Ned. Ind. 2, 1899, p. 513. — *Convolvulus penangianus* Wall., Cat., 1828, no 1425, nomen nudum. — *Moorcroftia penangiana* Choisy, Mém. Soc. Phys. Genève 6, 1833, p. 406, t. 4; id. in DC., Prod. 9, 1845, p. 335. — *Lettsomia penangiana* (Choisy) Miq., Fl. Ind. Bat. 2, 1857, p. 592; Clarke, Fl. Br. Ind. 4, 1883, p. 196; Prain, J. As. Soc. Beng. 63, 2, 1894, p. 99; id., ibidem 74, 2, 1906, p. 325; Ridl., Fl. Mal. Pen. 2, 1923, p. 451; Burk & Henders., Gard. Bull. S.S. 3, 1925, p. 400; Henders., Gard. Bull. S.S. 4, 1928, p. 292; id., Mal. Wild Flow. 2, 1950, p. 315, f. 297; excl. *var. reticulata* Prain.

A woody twiner. Stems terete, to 3 mm, the old woody parts to 7 mm diam., sparsely strigose-hirsute when young, soon glabrescent. Leaves slenderly petiolate; petiole 1½—5 cm long, hairy like the stems; blade ovate to broadly lanceolate, acute or slightly acuminate at the apex, rounded at the base or slightly cordate, 6—20 cm long, 2½—11 cm broad; upper surface glabrous, lower surface sparsely strigose when young, soon glabrescent; midrib distinctly, 7—8 nerves on either side of it slightly prominent beneath, impressed above, minor nervation usually inconspicuous; nerves from the base nearly straight, near the margin strongly curving upward. Inflorescences axillary; peduncles terete, very slender, longer than the petioles, 2½—20 cm long, sparsely strigose when young, soon glabrescent, cymosely (1—)3—15-flowered; bracts linear-lanceolate, ca 5 by ½ mm, slightly hirsute beneath, caducous. Pedicels ca 5—15 mm long when in flower, up to 2 cm when in fruit, slightly more densely strigose than peduncles. Sepals subequal, broadly ovate, ca 4—5 by 3½—4½ mm, the outer 2 with obtuse, the inner 3 with rounded apex; strigose outside, the outer 2 for the whole surface, the inner 3 on the central part only, the third on one side like the outer 2, on the other side like the inner 2. Corolla bright purple within, paler outside, funnel-shaped, with broad tube not manifestly distinct from the upper part of the corolla, ca 20—35 mm high, limb subentire, midpetaline bands hirsute outside, the connecting fields glabrous like the lower 5 mm. Stamens and style included. Stamens inserted ca 5 mm above the corolla base; filaments filiform, dilated at their bases, glabrous, ca 20 mm long; anthers linear, ca 4 mm long. Ovary 2-celled, conical, glabrous; style glabrous, ca 30 mm long; stigma biglobular, papillose. Disk annular, ca 0.6 mm high. Fruit ovoid, ca 15 mm long, pink, 1-seeded. Seeds glabrous.

MALAY PENINSULA, without locality, *Scortechini s.n.*, fl. & fr. (BZ, SING); Perak, Larut, *Kunstler 2048*, fl. July 1881 (K, L, SING), *2574*, fr. Nov. 1881 (K, SING), *5339*, fl. Dec. 1883 (K, L); Taiping, *Wray 2095*, fr. June 1888 (SING); Tupai, *Wray 2334*, fl. June 1888 (K, SING); Bilau Tujor, Larut, *Wray 2601*, fl. July 1888 (SING); Sungei Larut, *Wray 2733*, fl. Aug. 1888 (SING); Maxwell Hill, *Curtis 2034*, fl. Sept. 1889 (SING); Birch's Hill, *Fox 107*, fl. Oct. 1899 (SING); Larut Hill, *Derry s.n. (Curtis 3697)*, fl. 1900 (K, SING); Maxwell Hill, *Anderson 90*, fl. March 1911 (SING); Taiping Hill, *Henderson SF 11844*, fr. March 1924 (SING); Pondok Tanjong, *Burkill SF 13234*, fr. March 1924 (SING), *Spare SF 36303*, fl. July 1939 (SING); S. Krian, *Rauen SF 37662*, fl. Aug. 1939 (BZ, SING); Pulau Penang, Moniot's Road, *Curtis 1586*, fr. May 1888 (K, SING), Government Hill, *Curtis's Coll. = 1586*, fr. Apr. 1890 (SING), *Curtis 1586*, fr. March 1892 (K, SING), *Fox s.n. (Ridley 10450)*, fl. Aug. 1899 (K, SING).

Distribution: known only from the Malay Peninsula (Perak, Pulau Penang).

Habitat: forests from low altitude to 1700 m.

Remarks: Burkill & Holttum (Gard. Bull. S.S. 3, 1923, p. 62) cite under the name *Lettsomia penangiana* Miq. 2 specimens, one (7770) representing *Argyreia reticulata* (Prain) Hoogl., the other (8629) representing *Argyreia scortechinii* (Prain) Hoogl.

4. **Argyreia adpressa** (Choisy 1833) Boerl. 1899; Van Ooststr., Blumea 5, 1943, p. 367 — *Lettsomia adpressa* (Choisy 1833) Miq. 1857; Burk. & Holtt., Gard. Bull. S.S. 3, 1923, p. 62.

MALAY PENINSULA, Kedah, Sungei Patani, *Wolfe & Kadir SF 21463*, fl. Sept. 1938 (BZ, SING); Perak, without locality and *collector*, fl. (L); Larut, *King's Coll. 2457*, fl. & fr. Oct. 1881 (FI); Assam Kumbong, *Wray 1914*, fl. May 1888 (SING); Inpai, *Wray 3298*, fl. & fr. Oct. 1888 (SING); Blanda Mabok, *Wray 3961*, fl. Apr. 1890 (SING); Ipoh, Kinta, *Curtis = 318*, fl. Dec. 1895 (SING); Jor, *Haniff SF 14240*, fl. Sept. 1924 (SING); Selangor, Semangkok Pass, *Ridley s.n.*, fr. Jan. 1921 (K), *Burkill SF 8884*, fl. Sept. 1922 (SING); Langkawi Islands, Langkawi, Gunong Raya, *Haniff 15533*, fr. Feb. 1911 (K, SING); Pulau Penang, without locality and *collector*, fl. (K); without locality, *Wallich 1424*, fl. & fr. 1822 (K, type collection), *Phillips s.n.*, fl. 1824 (K); Government Hill, *Maingay 1144*, fl. & fr. (K, L); without locality, *Cantley 3171*, fl. (SING), *Kunstler 1324*, fr. Feb. 1881 (BZ); Government Hill, *Curtis 318*, fl. & fr. June 1885 (K, SING), fl. June 1886 (SING), *Ridley = 318*, fl. July 1889 (SING); without locality, *For. Guard s.n.*, fl. Sept. 1890 (SING); Penara Bukit, *Ridley s.n.*, fr. March 1896 (SING); Government Hill, *Curtis s.n.*, fr. June 1900 (SING).

5. **Argyreia scortechinii** (Prain) Hoogl. comb. nov. (Prain ms). — *Lettsomia scortechinii* Prain, J. As. Soc. Beng. 63, 2, 1894, p. 98; id., ibidem 74, 2, 1906, p. 326; Ridl., Fl. Mal. Pen. 2, 1923, p. 452; Burk. & Henders., Gard. Bull. S.S. 3, 1925, p. 400; Henders., J. Mal. Br. R. A. S. 5, 1927, p. 260.

A woody twiner. Stems terete, to 4 mm, the old woody parts to 7 mm diam., rather densely shortly strigose or strigose-hirsute to nearly glabrous, later on glabrescent. Leaves slenderly petiolate; petiole 1—4½ cm long, hairy like the stems; blade ovate to broadly ovate, acute to slightly acuminate at the apex, rounded at the base or slightly cordate, 4—11 cm long, 2½—7 cm broad; upper surface glabrous, lower surface strigose-hirsute, most densely so on the midrib and nerves, to nearly glabrous; midrib and 6—7 nerves on either side of it prominent beneath, slightly impressed above, minor nervation reticulate, invisible above, rather distinct beneath, nerves curving upward from the base. Inflorescences axillary; peduncles terete, 2—15 cm long, hairy like the stems, but slightly more densely so, cymosely 2—25-flowered; bracts triangular, ca 3 mm long, glabrous above, hirsute beneath, caducous. Pedicels ca 3 mm long when in flower, up to 1 cm when in fruit, hairy like the peduncles, but more densely so. Sepals unequal, the outer 2 broadly ovate, ca 5—5½ by 4½—5 mm, with rounded apex, densely and shortly appressed-pilose outside, glabrous inside, the inner 2 transverse-elliptic, ca 5½—6 by 7—7½ mm, with rounded apex, with ca 2—2½ mm broad hairy band in the middle, further glabrous, the third one on one side like the outer 2, on the other side like the inner 2. Corolla pale pink to nearly white outside, mauve (*Ridley 5559*) or deep magenta (*SF 8629*) inside, funnelshaped with the tube not distinct from the upper part, ca 25 mm high, limb shallowly lobed, basal part (ca 8 mm) glabrous, midpetaline bands hirsute, connecting fields glabrous outside. Stamens and style included. Stamens inserted ca 3 mm above the corolla base; filaments filiform, dilated at their bases, glabrous, ca 11 mm long; anthers linear, ca 3 mm long. Ovary 2-celled, conical, ca 2 mm high, glabrous; style glabrous, 16 mm long; stigma biglobular, papillose. Disk annular, ca 1 mm high. Fruit ovoid, ca 1.6 cm long, 1-seeded. Seeds glabrous.

MALAY PENINSULA, without locality, *Scortechini s. n.*, fr. (K, type); Perak, The Cottage, Taiping, *Hervey s. n.*, fr. 1889 (SING), *Ridley 5559*, fl. & fr. Feb. 1891 (SING); Bukit Birch, *Fox 180 (Ridley 10681)*, fr. Oct. 1899 (SING); Gunong Hijau, *Anderson 63*, fr. March 1911 (SING); Maxwell Hill, *Burkill & Haniff SF 13943*, fr. March 1924 (SING), *Strugnell CF 14517*, fr. Dec. 1927 (SING); Pahang, Fraser Hill, *Burkill & Holttum SF 8629*, fl. Sept. 1922 (BZ, SING); Cameron Highlands, *Nat. Coll. F. M. S. Mus. 11585*, fl. Oct. 1923 (SING), *Henderson SF 23493*, fl. Apr. 1930 (BZ, SING), *Nur SF 32863*, fl. Apr. 1937 (L, SING), *Batten Pooll s. n.*, fl. & fr. Nov. 1939—Jan. 1940 (SING).

Distribution: known only from the Malay Peninsula (Perak and Pahang).

Habitat: as far as known only at ca 1300—1500 m.

6. **Argyreia sphaerocephala** (Prain) Hoogl. comb. nov. (Prain ms). — *Lettsomia sphaerocephala* Prain, J. As. Soc. Beng. 73, 2, 1904, p. 19; id., ibidem 74, 2, 1906, p. 323; Ridl., Fl. Mal. Pen. 2, 1923, p. 450.

A woody twiner. Stems terete, to 3 mm diam., light brown, sparsely strigose. Leaves slenderly petiolate; petiole 1—3½ cm long, sparsely strigose; blade narrowly ovate, acute or slightly acuminate at the apex, rounded at the base, 5—10 cm long, 2½—4 cm broad; sparsely strigose on both sides; midrib and 5—6 nerves on either side of it slightly prominent beneath, impressed above; nerves from the base curving upward. Inflorescences axillary; peduncles slender, terete, sparsely strigose, up to ca 20 cm long, $^{2}/_{3}$—1 mm diam.. Flowers in a dense, ca 30-flowered, capitate cyme; diam. of the capitulum (with flowers in bud) ca $3^{1}/_{2}$ cm; outer bracts transverse-elliptic, ca $2^{1}/_{2}$ by 3 cm, hirsute outside, sparsely so inside, innermost bracts obovate-spathulate, ca 5 by 3 mm, hirsute outside, glabrous inside. Pedicels 3—4 mm long. Sepals ovate, the outer 2 obtuse, the third rounded, the inner 2 retuse at the apex, 4—4.3 by 3—3.3 mm, hirsute near the apex only, in the inner 2 in the central part only. Corolla pink, infundibuliform-campanulate (*Prain*), $2^1/_2$ cm high (*Prain*), limb probably subentire, midpetaline bands hirsute, connecting fields and lower part glabrous. Stamens glabrous; anthers in bud 2 mm long. Ovary 2-celled, conical, in bud 0.8 mm high, glabrous; style glabrous; stigma biglobular, papillose; disk annular, in bud ca 0.3 mm high. Fruit unknown.

MALAY PENINSULA, Perak, Krian, *Scortechini 1384*, in bud Oct. 1884 (K, type collection); Abu Salama, *Scortechini 1384*, in bud Oct. 1884 (K).

Distribution: known only from the Malay Peninsula (Perak).

Remarks: I have only seen buds with the corolla ca 5 mm long. It is a very remarkable species, easily recognized by the capitate inflorescence with large bracts at the end of the long and slender peduncle. The bracts and leaves, which are probably young in both collections known to me, are reddish in a dry state.

7. **Argyreia capitata** (Vahl 1794) Choisy 1833; Van Ooststr., Blumea 5, 1943, p. 368. — *Lettsomia peguensis* Clarke, Fl. Br. Ind. 4, 1883, p. 193; Prain, J. As. Soc. Beng. 63, 2, 1894, p. 94; id., ibidem 74, 2, 1906, p. 322; Ridl., Fl. Mal. Pen. 2, 1923, p. 450; Henders., Gard. Bull. S. S. 4, 1928, p. 292.

PENINSULAR SIAM, Surat, Kau Hoa Kwai, *Seidenfaden 2138*, fl. Jan. 1935 (SING).

MALAY PENINSULA, without locality, *Scortechini 1628*, fl. (SING); Kedah, Alor Sta, *Ridley 14898*, fr. March 1910 (K, SING); Prov. Wellesley, Permatang Berlau, *Ridley s. n.*, fl. Dec. 1895 (SING); Muda Riv. near Dusun Gajah, *Burkill SF 3073*, fl. Jan. 1918 (SING); Perak, Gopeng, *Kunstler 1077*, fl. Nov. 1880 (SING); Larut, *Kunstler 2622*, fl. Dec. 1881 (K); near Ulu Kerling, *Kunstler 8627*, fr. March 1886 (BZ, SING); track to Jor, *Ridley 13697*, fl. Nov. 1908 (SING); Kelantan, Kelantan Riv., *Ridley s. n.*, fl. Feb. 1917 (K); Pahang, Kuala Tahan, *Seimund 913*, fl. March 1921 (SING); Temerloh, Titi Bungor, *Henderson SF 10650*, fr. March 1923 (SING); Selangor, Klang Gates Lowland, *Ridley s. n.*, fl. (K); Gua Batu, *Ridley 8210* (SING), *8227* (K, SING), fl. Dec. 1890; Petaling, *Ridley 10194*, fl. 1899 (SING); Negri Sembilan, Bukit Danan, *Alvins 410*, fl. Jan. 1885 (SING); Beranang, *Alvins 1996*, fl. Nov. 1885 (SING); near Kending, *Burkill SF 1442*, fl. Jan. 1916 (SING); Langkawi Islands, Kuala Quah, Langkawi, *Haniff & Nur SF 7063*, fl. Nov. 1921 (K, SING); Pulau Penang, *Anonymus 2555*, fl. (SING); Waterfall, *Curtis 498*, fl. Nov. 1885 (K, SING); *Curtis = 498*, veg. Oct. 1894 (SING); Balik Pulau, *For. Guard 2 s. n.*, fl. Dec. 1904 (SING); S of Ginting Pass, *Burkill SF 4619*, fl. Dec. 1918 (SING).

Habitat: thickets, open ground, waysides; at low altitude.

Vernacular names: akar tapah rusa (Prov. Wellesley, *Ridley*), akar tumiang (Negri Sembilan, *Alvins*), akar ulan bukit (Negri Sembilan, *Alvins*), lana bulu (Pulau Penang, *For. Guard*).

Remarks: 1. The type of *Lettsomia peguensis* Clarke is unknown to me. The Malayan specimens, identified as this species, are undoubtedly conspecific with the present species. Clarke already indicated that his species might be only a marked local variety of the present species, differing only in the type of hairiness. Van Ooststroom notes that the hairiness of the present species varies to a considerable extent. If *Lettsomia peguensis* is included, the known area of the species comprises, except the area indicated by Van Ooststroom, also the Andaman Islands; a further extension is found in a collection from Siam: Chantaboon, *Vesterdal* (SING).

2. The shape of the bracts varies greatly; the outer ones may be elliptic to narrowly lanceolate.

8. Argyreia ridleyi (Prain 1894) Prain ex Van Ooststr., Blumea 5, 1943, p. 370. — *Lettsomia ridleyi* Prain 1894; Henders., Gard. Bull. S.S. 4, 1928, p. 292. — *Lettsomia ridleyi* Prain *var. velutina* Prain, J. As. Soc. Beng. 63, 2, 1894, p. 99; id., ibidem 74, 2, 1906, p. 324; Ridl., Fl. Mal. Pen. 2, 1923, p. 451.

MALAY PENINSULA, Perak, Sonkay Riv., *Curtis 503*, fl. & fr. Dec. 1885 (SING); Pahang, Baloh Res., *Sow CF 8191*, fr. March 1930 (SING); Trengganu, Kemaman, Bukit Kajang, *Corner s.n.*, fr. Nov. 1935 (SING); Kemaman, Sungai Nipa, *Corner s.n.*, fl. Nov. 1935 (SING); Selangor, Klang, *Kehding s.n.*, fl. Dec. 1878 (FI); Parawang Kwala Lumpur, *Ahmat s.n.*, fl. 1890 (SING); Pahang Track. *Ridley 8550*, fl. 1897 (SING); Telok Res., Klang, *Burkill SF 5999*, fr. March 1921 (K, SING); Klang Watercatchment For., *Burkill SF 9170*, fr. Oct. 1922 (SING), *Nur SF 8346*, fr. Jan. 1923 (BZ, SING); Negri Sembilan, Selaru For. Res., *Holttum SF 9729*, fr. Nov. 1922 (SING); Johore, Ulu Batu Pahat, *Lake & Kelsall s.n.*, fl. & fr. Nov. 1892 (SING); Kota Tinggi, *Ridley 4214*, fl. & fr. Dec. 1892 (SING, type of *Lettsomia ridleyi* Prain); Gunung Pulai, *Ridley 12196*, fr. Dec. 1904 (K, SING); Gunung Muntahak, *Holttum SF 19892*, fr. March 1928 (BZ, SING); Kota Tinggi, *Teruya 999*, fl. Oct. 1929 (SING); Kota Tinggi-Mawai road, *Corner s.n.*, fr. Feb. 1935 (SING); Sungei Kayu, Mawai-Temaluang road, *Corner SF 32457*, fl. & fr. Oct. 1936 (SING); Mersing, *Kostermans s.n.*, fl. Aug. 1938 (BZ, SING); Singapore, Selitar, *Goodenough s.n.*, fr. Oct. 1889 (SING); Bukit Maidai, *Goodenough 1635*, fl. June 1890 (SING); North Selitar, *Ridley s.n.*, fr. 1891 (SING); Chan Chu Kang, *Ridley s.n.*, fl. & fr. 1892 (SING), *Goodenough 1635b*, fl. June 1892 (SING); Bukit Mandai, *Goodenough s.n.*, fl. July 1892 (SING); Chan Chu Kang, *Bakar s.n.*, fl. 1893 (SING); Bukit Mandai, *Ridley 1635c*, fl. 1894 (SING, type of *var. velutina* Prain); Jalan Brass, *Niat (Ridley's Coll.) s.n.*, fr. Feb. 1894 (SING); Chan Chu Kang, *Ridley 6710*, fl. Aug. 1894 (BZ, SING); Reservoir Woods, *Ridley s.n.*, fr. March 1905 (SING); Jurong Road, *Burkill SF 708*, fr. Jan. 1915 (BZ, K); Mandai Road, *Burkill SF 4675*, fr. Jan. 1919 (SING), *6107*, fl. Aug. 1920 (BZ, SING), *5975*, fr. Feb. 1921 (BZ, SING), *11422*, fl. Feb. 1924 (BZ).

Vernacular names: akar simpis (Pahang, *Sow*), akar saga molek (fide Ridley, 1923).

Remarks: 1. Prain's *var. velutina* differs from "*var. typica*" (Prain, 1894, p. 98) by its somewhat smaller leaves and by being more densely hirsute. The differences do not make the impression to be of great importance, and may be due to differences in age and/or habitat.

2. In some specimens, e. g. *Teruya 999, SF 19892, SF 32457*, the bracts are much narrower than described by Van Ooststroom, viz. lanceolate, up to ca 3 cm long. In *SF 32457* this may be caused by a gall insect, in the other collections it makes a completely natural impression. Intermediate forms to the ovate bracts are frequent. In *Kehding s. n.* the lower bracts have fallen off, only the upper ones are persistent.

9. Argyreia maingayi (Clarke) Hoogl. comb. nov. — *Lettsomia maingayi* Clarke, Fl. Br. Ind. 4, 1883, p. 195; Ridl., Trans. Linn. Soc. Lond. 3, 1893, p. 323; Prain, J. As. Soc. Beng. 63, 2, 1894, p. 99; id., ibidem 74, 2, 1906, p. 323; Ridl., Fl. Mal. Pen. 2, 1923, p. 450; Henders., Gard. Bull. S.S. 4, 1928, p. 292; id., J. Mal. Br. R. A. S. 17, 1939, p. 59; id., Mal. Wild Flow. 2, 1950, p. 314.

A large woody climber. Stems terete, to 3 mm, the old woody parts to 6 mm diam., light brown, patently fulvous-hirsute when young, later on glabrescent. Leaves slenderly petiolate; petiole $1^1/_2$—5 cm long, sparsely patent- to appressed-hirsute; blade ovate, rarely elliptic-oblong or obovate, acuminate at the apex, rounded at the base or shortly attenuate into the petiole, 9—20 cm long, $3^{1}/_{2}$—11 cm broad; upper surface glabrous or nearly so, lower surface strigose-hirsute on the nerves only; midrib and 5—6 nerves on either side of it prominent beneath, minor nervation reticulate, rather prominent beneath, all more or less impressed above; nerves from the base curving upward. Inflorescences axillary; peduncles stout, terete, patently hirsute, $1^{1}/_{2}$—5 cm long, when dry deeply longitudinally grooved. Flowers in a dense capitate cyme at the end of the peduncle; diam. of the capitulum generally 5—9 cm, with the corollas up to 17 cm, sometimes smaller in poorly developed specimens; outer bracts broadly ovate to narrowly lanceolate, obtuse to acute at the apex, rounded at the base, $2^{1}/_{2}$—4 cm long, (0.4—)1—$2^{1}/_{2}$ cm broad, rather sparsely fulvous-hirsute to nearly glabrous outside and at the margins, glabrous inside; the upper bracts smaller and narrower, oblong to linear-oblong, up to 2 cm long. Pedicels very short or none. Sepals ovate-oblong, long-acuminate, the 3 outer ones 11—15 mm long, of which the acumen 6—9 mm, outside long-hirsute with fulvous patent hairs, the basal part, ca 4 mm, glabrous, inside glabrous, the 2 inner ones 9—13 mm long, of which the acumen 4—7 mm, slightly less densely hairy than the 3 outer ones. Corolla white with pink, red, crimson, or purple stripe on the middle of each lobe, funnel-shaped with distinct tube, $4^{1}/_{2}$—6 cm high, limb subentire, midpetaline bands hirsute outside, connecting fields glabrous. Stamens and style included. Stamens inserted ca 7—8 mm above the corolla base; filaments filiform, shortly glandular-pilose at their bases, ca 18 mm long; anthers linear, ca 4 mm long. Ovary 2-celled, cylindric, glabrous; style glabrous, ca 26 mm long; stigma biglobular, papillose. Disk annular, shallowly 5-lobed, about 1 mm high. Fruit ovoid, ca 12 mm long, pink, 1-seeded. Seeds glabrous.

MALAY PENINSULA, without locality, *Griffith 5878*, fr. (K); Perak, Changkat Mentri, *Kloss 6483 & 6515*, fl. Sept. 1918 (K); Pahang, Kota Glanggi, *Ridley s. n.*, fl. Aug. 1891 (SING); Sungai Nering, Temerloh, *Henderson SF 10727*, fr. March 1925 (SING); Jerantut, *Burkill & Haniff SF 16054*, fr. Nov. 1924 (SING); Sungai Tahan, near Kuala Teku, *Holttum SF 20817*, fl. Sept. 1928 (BZ, SING); Gunong Senyum, *Henderson s. n.*, fl. July 1929 (SING); Bt Kuman, Raub, *Syed Alli CF 23356*, fr. Dec. 1930 (SING); Bukit Cheras, *Henderson SF 25066*, fl. Oct. 1931 (SING); Sungei Teku, *Kiah SF 31789*, fl. July 1936 (SING); Selangor, Kwala Lumpur, *Ahmat s. n.*, fr. 1881 (SING); Ulu Gombak, *Hume 9178*, fl. Oct. 1921 (SING); Ginting Simpak, *Hume 9697*, fl. Nov. 1921 (SING); Negri Sembilan, Sungei Ujong, *Alvins 2108*, fl. Nov. 1885 (SING); Gemas, *Burkill SF 3539*, fl. Nov. 1918 (BZ, SING); Gunong Angsi, *Nur SF 11558*, fl. Nov. 1923 (SING); Bukit Tangga, *Nur SF 11834*, fr. Dec. 1923 (SING); Gemas, *Nur SF 15252*, fl. Aug. 1924 (SING); Malacca, *Maingay 1151*, fl. July 1866 (K, type collection), *Alvins 202*, fl. Nov. 1884 (SING), *Alvins 140*, fr. Dec. 1884 (SING); Selandar, *Alvins 702*, fr. Jan. 1885 (SING); Châbau, *Alvins 2202*, fl. Sept. 1885 (SING); foot of Ophir, *Hullett 843*, fr. Apr. 1888 (K); Bukit Bruang, *Derry 318*, fl. Nov. 1889 (SING); Ayer Panas, *Derry 388*, fr. Feb. 1890 (SING); Selandar, *Holmberg 886*, fl. Oct. 1891 (SING); Bukit Sedanau, *Goodenough 1432*, fl. Aug. 1893 (SING); Johore, Kuala Tebing Tinggi, *Ridley s. n.*, fr. 1900 (SING); Genuang, *Ridley s. n.*, fr. March 1915 (K); Pulau Penang, Sonkay Riv., *Curtis 503*, fl. Dec. 1885 (K).

Distribution: known only from the Malay Peninsula.

Habitat: jungle, swamp, and edge of rivers, up to 1000 m altitude.

Vernacular names: akar bungah butang (Malacca, *Alvins*), akar sumulut (Negri Sembilan, *Alvins*), akar trong trong (Malacca, *Goodenough*), akar ulan gajah (Malacca, *Hullett*), bunga akar saptu utan (Selangor, *Ahmat*), akar k'lupus (Malacca, *Alvins*), tentarong (fide Ridley, 1923).

Use: "the fruits are eaten by the Malays, sweet taste" (*Alvins 206*), "the roots are to be boiled and applied in cases of bone pain" (*Alvins 2108*).

Remarks: As is the case in *Argyreia ridleyi* (Prain) Prain ex Van Ooststr. and *Argyreia capitata* (Vahl) Choisy the shape of the bracts varies a great deal. In some collections (*SF 20817, SF 25066, SF 31789*) they are narrowly lanceolate, the largest ca 30 by 3 mm, in most specimens they are broader, up to broadly ovate, with a relatively small number of intermediates.

10. **Argyreia rubicunda** Choisy, Mém. Soc. Phys. Genève 6, 1833, p. 426; id. in DC., Prod. 9, 1845, p. 333; cf. Van Ooststr., Blumea 7, 1952, p. 172; non Van Ooststr., Blumea 5, 1943, p. 371. — *Convolvulus rubicundus* Wall., Cat., 1828, no 1409, nomen nudum. — *Lettsomia rubicunda* (Choisy) Clarke, Fl. Br. Ind. 4, 1883, p. 195; Ridl., Fl. Mal. Pen. 2, 1923, p. 453.

MALAY PENINSULA, Negri Sembilan, Gâong Talan, *Alvins 1183,* fr. Feb. 1885 (SING); Malacca, *Cantley s.n.,* fr. (SING), *Griffith s.n. & 5848,* buds & fr. (K), *Maingay 1143 (2433),* fl. Oct. 1867/8 (K).

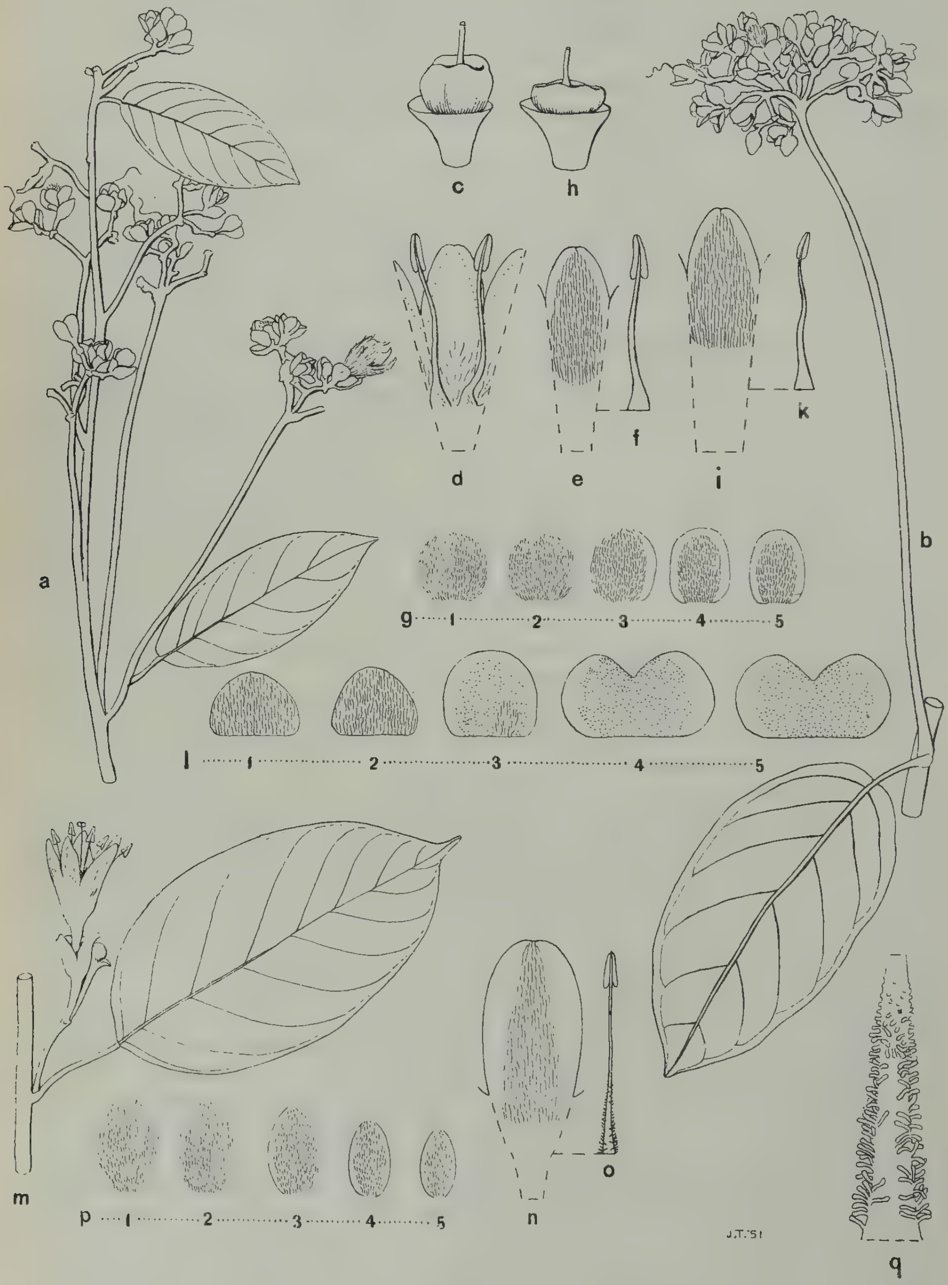
Distribution: known only from the Malay Peninsula (Negri Sembilan, Malacca).

Vernacular names: akar pera bentag (Malacca, *Cantley*), akar sagâ moleh (Negri Sembilan, *Alvins*).

Remarks: For discussion of the differences of the present species with *Argyreia pseudorubicunda* Van Ooststr., cf. Van Ooststr., 1952, l. c..

11. **Argyreia kunstleri** (Prain) Prain ex Van Ooststr., Blumea 5, 1943, p. 382, 383. — *Lettsomia kunstleri* Prain, J. As. Soc. Beng. 63, 2, 1894, p. 100; id., ibidem 74, 2, 1906, p. 327; Ridl., Fl. Mal. Pen. 2, 1923, p. 453; Burk. & Henders., Gard. Bull. S. S. 3, 1925, p. 400; Henders., Gard. Bull. S. S. 4, 1928, p. 292. — *Lettsomia curtisii* Prain, J. As. Soc. Beng. 63, 2, 1894, p. 100; id., ibidem 74, 2, 1906, p. 325; Ridl., Fl. Mal. Pen. 2, 1923, p. 451; Burk. & Henders., Gard. Bull. S. S. 3, 1925, p. 400; Henders., Gard. Bull. S. S. 4, 1928, p. 292. — *Argyreia curtisii* (Prain) Prain ex Van Ooststr., Blumea 5, 1943, p. 367. *Fig. 1 h—l.*

A large woody twiner, up to 30 m high. Stems terete, to 3 mm, the old woody parts to 6 mm diam., fulvous-strigose, sometimes with additional short, slightly patent hairs. Leaves slenderly petiolate; petiole 1—5 cm long, hairy like the stems; blade ovate to broadly ovate, acuminate at the apex, obtuse to rounded at the base, often shortly attenuate, 6—15 cm long, 3—10 cm broad; upper surface glabrous except a few strigose hairs on the midrib, lower surface densely to sparsely fulvous-hirsute, most densely so on the nerves; midrib and 7—11 nerves on either side of it prominent beneath, more or less impressed above, minor nervation reticulate, inconspicuous; nerves from the base curving upward. Inflorescences axillary; peduncles terete, longer than the petioles, 5—20 cm long, hairy like the stems, cymosely 3—30-flowered; bracts linear-lanceolate, ca 5 by $^1/_2$ mm,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slightly hirsute beneath, caducous. Pedicels ca 3 mm long, hairy like the peduncles. Sepals unequal, the outer 2 broadly ovate, ca $4^1/_2$ by 5 mm, with rounded apex, hirsute at least in the basal half outside, the inner 2 transverse-elliptic, ca 6 by $7^1/_2$ mm, with rounded apex, often incised at 1(—3) places near the centre, most deeply so when in fruit, glabrous outside or sparsely hirsute in a small basal part only, the third sepal on one side like the outer 2, on the other side like the inner 2. Corolla whitish or pinkish outside, bright red inside, funnel-shaped, with broad tube, not manifestly distinct from the upper part of the corolla, 15—18 mm high, limb distinctly 5-lobed with ca 5 mm deep incisions, basal part (ca 6 mm) glabrous, midpetaline bands hirsute outside, the lobes with a 1 mm broad, thin, glabrous wing on each side along the whole length. Stamens and style about as high as the corolla. Stamens inserted ca 3 mm above the corolla base; filaments filiform, dilated at their bases, glabrous, ca 10 mm long; anthers linear, ca $2^1/_2$ mm long. Ovary 2-celled, rounded-conical, ca 1 mm high, glabrous; style glabrous, 14 mm long; stigma biglobular, papillose. Disk annular, shallowly 5-lobed, ca $^3/_4$ mm high. Fruit ovoid, ca 15 mm long, deep red, 1-seeded. Seeds glabrous.

MALAY PENINSULA, Perak, Gopeng, *Kunstler 732*, fl. Sept. 1880 (K, type, SING); Larut, *Kunstler 2307*, fl. Sept. 1881 (BZ), *2726*, fr. Jan. 1882 (K), *5672*, fl. March 1884 (K, SING); Abu Salama, *Scortechini 1362*, fl. Oct. 1884 (K, SING); Kota, Larut, *Wray 2856*, fl. 1888 (SING); Kwala Dipang, *Ridley 9704*, fl. Oct. 1898 (K, SING); Sungei Brotal, *Ja'Amat CF 39254*, fl. Feb. 1935 (SING); Kelantan, Sungei Keteh, *Nur & Foxworthy SF 12041*, fr. Feb. 1924 (BZ, K, SING); Pahang, Bentong, *Burkill & Haniff SF 16498*, fl. Nov. 1924 (SING); Jerantut, *Burkill & Haniff SF 16083*, fr. Nov. 1924 (SING); Sungei Gesoh, Cameron Highlands, *Ja'Amat CF 28275*, fl. Sept. 1931 (SING); Kemaman, Bukit Kajang, *Corner s.n.*, fr. Nov. 1935 (SING); Selangor, Kwala Lumpur, *Curtis 2358*, fr. Feb. 1890 (SING, type of *Lettsomia curtisii* Prain); Batu Caves Woods, *Ridley 8220*, fl. Dec. 1896 (SING); Pahang Track, *Ridley s.n. & 8563*, fl., resp. fr. July 1897 (SING); Bukit Kutu, *Goodenough s.n.*, fl. Oct. 1899 (SING); Sungei Buluh, *Ridley s.n.*, fl. March 1915 (K); Ulu Gombak, *Hume 9175*, fl. Oct. 1921 (SING), *Hume 9627*, fl. Nov. 1921 (SING); Ginting Simpoh, *Strugnell CF 12101*, fl. Oct. 1926 (SING); Ulu Gomgak, *Strugnell CF 12453*, fl. Sept. 1926 (SING), *Strugnell CF 12636*, fr. Jan. 1927 (SING); Negri Sembilan, Sungei Ujong, *Alvins s.n.*, fl. (SING); Bukit Tangga, *Nur SF 11841*, fl. & fr. Dec. 1923 (BZ, SING).

Distribution: known only from the Malay Peninsula.

Habitat: open jungle, up to 700 m altitude.

12. Argyreia ooststroomii Hoogl. spec. nov. *Fig. 1 a—g.*

Argyreiae kunstleri Prain affinis, differt: bracteis late ovatis, subtus hirsutis, floribus paulo minoribus, sepalis subequalibus extus hirsutis, corolla intus hirsuta.

A woody twiner. Stems terete, to 3 mm, the old woody parts to 5 mm

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Fig. 1 — a, b, c, d, e, f, g. *Argyreia ooststroomii* Hoogl. (p. 188), type collection; a. branch with terminal inflorescence; b. branch with axillary inflorescence; c. ovary with disk; d. inner side of the corolla, showing the hairs above the insertion of the stamens; e, f. segment of corolla (outer side) and stamen, with indication of the insertion-level of the latter; g_1—g_5. sepals 1—5; h, i, k, l. *Argyreia kunstleri* (Prain) Prain ex Van Ooststr. (p. 186); h. ovary with disk; i, k. segment of corolla (outer side) and stamen, with indication of the insertion-level of the latter; l_1—l_5. sepals 1—5; m, n, o, p, q. *Argyreia corneri* Hoogl. (p. 191), type specimen; m. branch with axillary inflorescence; n, o. segment of corolla (outer side) and stamen, with indication of the insertion-level of the latter; p_1—p_5. sepals 1—5; q. basal part of stamen. a, b, m: × $^2/_3$; c, h: × 3; d, e, f, g, i, k, l: × 2; n, o, p: × $1^1/_2$; q: × 5.

diam., fulvous-strigose with 0.2—1.0 mm long, partly slightly patent hairs. Leaves shortly petiolate; petiole 1—$4^1/_2$ cm long, hairy like the stems; blade ovate, acute or slightly acuminate at the apex, rounded at the base or slightly cordate, 6—14 cm long, $3^1/_2$—$8^1/_2$ cm broad; upper surface sparsely strigose on the midrib, glabrous on the lateral nerves and intervenium, lower surface strigose on the midrib and lateral nerves, sparsely so on the intervenium; midrib and 5—8 nerves on either side of it prominent beneath, more or less impressed above, minor nervation reticulate, rather inconspicuous; nerves from the base slightly, near the margin strongly curving upward. Upper inflorescences forming a rather lax panicle, composed of more or less long-peduncled cymes, leafless or with a few small leaves, lower ones axillary; peduncles terete, longer than the petioles, 3—16 cm long, hairy like the stems, cymosely ca 25-flowered; bracts ovate, ca 5 by $4^1/_2$ mm, rounded, often shallowly split at the apex, hirsute beneath, caducous. Pedicels ca 3 mm long, hairy like the peduncles. Sepals subequal in form, broadly ovate, ca 4 by $4^1/_2$ mm, the outer 2 wholly fulvous-hirsute, the inner 2 with a ca $^1/_2$ mm broad glabrous margin, the third one with one glabrous and one hirsute margin. Corolla white, tube violet mauve, inside dark purple, funnel-shaped with broad tube not manifestly distinct from the upper part of the corolla, ca 13 mm high, limb distinctly 5-lobed with ca 4 mm deep incisions, basal part (ca $3^1/_2$ mm) glabrous, midpetaline bands hirsute outside, the lobes with a $^1/_2$ mm broad, thin glabrous wing on each side along the whole length; corolla sparsely hirsute inside on a ca 4 mm high field above the insertion of the stamens. Stamens and style about as high as the corolla. Stamens inserted ca $2^1/_2$ mm above the corolla base; filaments filiform, dilated at their bases, glabrous, ca 8 mm long; anthers linear, ca $2^1/_2$ mm long. Ovary 2-celled, rounded-conical, ca 1 mm high, glabrous; style glabrous, 11 mm long; stigma biglobular, papillose. Disk cupular, shallowly 5-lobed, ca 1.2 mm high. Fruit (unripe?) ovoid, ca 12 mm long, pink, 1-seeded. Seeds glabrous.

MALAY PENINSULA, Kelantan, Chaning, *Ridley s.n.*, fl. Feb. 1917 (K, type, SING); Kuala Krai, *Haniff & Nur SF 10080*, fl. Jan. 1923 (SING); Trengganu, Kuala Berang, *Holttum SF 15320*, fr. May 1925 (BZ, K, SING).

Distribution: known only from the Malay Peninsula (Kelantan and Trengganu).

Habitat: on edge of secondary jungle (*Holttum*).

Remarks: The present species is related to *Argyreia kunstleri* (Prain) Prain ex Van Ooststr. and closely resembles that species, differing in the following characters: the broadly ovate bracts (in *A. kunstleri* linear-lanceolate), which are hirsute beneath (much less densely in *A. kunstleri*), the slightly smaller, ca 13 mm high flowers (15—18 mm in *A. kunstleri*), the subequal sepals (in *A. kunstleri* the innermost sepals are distinctly broader than the outer ones), which are all hirsute outside (in *A. kunstleri* much less densely hairy, the 2 inner ones practically glabrous), and the few hairs on the inner side of the corolla (which are absent in *A. kunstleri*).

13. **Argyreia reticulata** (Prain) Hoogl. stat. nov. — *Lettsomia penangia var. reticulata* Prain, J. As. Soc. Beng. 63, 2, 1894, p. 99; id., ibidem 74, 2, 1906, p. 325; Ridl., Fl. Mal. Pen. 2, 1923, p. 451.

A woody winder, to 10 m long. Stems terete, to 4 mm diam., sparsely strigose. Leaves slenderly petiolate; petiole 1—3 cm long, strigose; blade ovate to broadly lanceolate, $1^1/_2$—$2^1/_2$ × as long as broad, slightly acuminate at the apex, obtuse to rounded at the base, $5^1/_2$—10 cm long, $2^1/_2$—$4^1/_2$ cm broad; upper surface sparsely strigose, later on glabrescent, lower surface sparsely strigose; midrib and 4—5 nerves on either side of it prominent beneath, impressed above, minor nervation reticulate, rather conspicuous beneath; nerves near the base rather straight, near the margin distinctly curving upward. Inflorescences axillary; peduncles terete, 2—9 cm long, strigose, cymosely 3—15-flowered; bracts linear-lanceolate, ca 5 by $^1/_2$ mm, strigose beneath, caducous. Pedicels ca 7—9 mm long. Sepals all ovate, the outer 2 ca $7^1/_2$ by 4 mm, the inner 2 ca 7 by 5 mm, broadly acute at the apex (*var. reticulata*), or the outer 2 ovate, ca 4 by 3 mm, broadly acute at the apex, the inner 2 transverse-oval, ca 4 by $4^1/_2$ mm, rounded, mucronate at the apex (*var. microcalyx*), the outer 2 rather sparsely strigose on the whole surface outside, the inner 2 on a ca $1^1/_2$ mm broad central line only, the third on one side like the outer 2, on the other side like the inner 2. Corolla waxy white, pale blue inside, funnel-shaped, ca 20—25 mm high, with distinct, ca $7^1/_2$ mm long tube; limb distinctly 5-lobed with ca 10 mm deep incisions; tube glabrous, midpetaline bands hirsute outside, the lobes with a $1^1/_2$ mm broad thin glabrous wing on each side along the whole length. Stamens and style about as high as the corolla. Stamens inserted ca 7 mm above the corolla base; filaments filiform, dilated at their bases, ca 18 mm long; basis with rather thin glandular hairs; anthers linear, ca 3 mm long. Ovary 2-celled, high-conical, 1.7 mm high, glabrous; style glabrous, ca 22 mm long; stigma biglobular, papillose. Disk annular, shallowly 5-lobed, ca 0.8 mm high. Fruit ovoid, ca 15 mm high, magenta, 1-seeded. Seeds glabrous.

MALAY PENINSULA, Perak, Ulu Kerling, *Kunstler 8544*, fr. March 1866 (K, type); Pahang, Frazer Hill, *Burkill & Holttum SF 7770*, fr. Sept. 1922 (K, SING), *Nur SF 11289*, fl. Sept. 1923 (SING); Selangor, Klang, *Kehding s. n.*, fl. Dec. 1878 (FI); Semangkok Pass, *Ridley s. n.*, fr. Jan. 1921 (K); Sg. Bulok For. Res., *Strugnell CF 27925*, fl. Jan. 1932 (SING).

Distribution: known only from the Malay Peninsula.

Habitat: open bamboo forest and on cleared places, 150—1400 m altitude.

Remarks: 1. Regarding the leaves only, the present species strongly resembles *Argyreia penangiana* (Choisy) Boerl., to which Prain referred it as a variety. From a study of the flowers, which Prain had not at his disposal, it is clear, however, that it is a distinct species, differing from *Argyreia penangiana* primarily by the distinctly 5-lobed corolla, the narrower sepals, and the hairiness of the basal part of the stamens.

2. The sepals of *Kehding s. n.* and *Strugnell CF 27925* are smaller, particularly shorter, than those of the other collections; I have not been able to find additional differences in the flower or in other parts. I consider these specimens to represent a new variety of the species, differing from *var. reticulata* by the length and shape of the calyx only.

var. **microcalyx** Hoogl. var. nov.

Differt a *var. reticulata* calyce breviore, sepalis 2 externis late ovatis, ca 4 × 3 mm, sepalis 2 internis transverso-ovalia, ca 4 × $4^1/_2$ mm. Holotypus: *Kehding s. n.* (FI); paratypus: *Strugnell CF 27925* (SING).

14. **Argyreia corneri** Hoogl. spec. nov. *Fig. 1 m—q*.

Species nova foliis ovatis, acuminatis, supra glabris, subtus sericeis; inflorescentiis axillaribus, uni- vel pauci-floris; sepalis late ovatis, extus dense sericeo-hirsutis; corolla 5-lobata, lobis margine glabra ad $2^1/_2$ mm lata; staminibus basi glandulosis; ovario 2-locellato.

A woody twiner, to 17 m long. Stems terete, to $2^1/_2$ mm diam., strigose. Leaves slenderly petiolate; petiole 1—$2^1/_2$ cm long, strigose; blade ovate, acuminate at the apex, obtuse to rounded at the base, $3^1/_2$—7 cm long, 2—4 cm broad; upper surface glabrous except the strigose midrib, lower surface densely light-yellowish sericeous; midrib and 5—6 nerves on either side of it prominent beneath, impressed above, minor nervation reticulate, inconspicuous; nerves from the base slightly, near the margin strongly curving upward. Inflorescences axillary; peduncles terete, 10—18 mm long, densely sericeous with slightly distant hairs, cymosely 1—5-flowered, usually 1-flowered, the other buds probably not fully developing; bracts lanceolate, ca 4 by $^1/_2$ mm, densely sericeous, caducous. Pedicels ca 4—6 mm long, densely sericeous. Sepals broadly ovate, the outer 3 ca $8^1/_2$ by 7 mm, the inner 2 ca $6^1/_2$ by $5^1/_2$ mm; broadly acute to rounded at the apex, densely sericeo-tomentose outside, the margins of the 2 inner sepals and one of the third sepal less densely hairy, glabrous only in the lower 2—4 mm. Corolla pale pinkish white outside, rose-pink inside, funnel-shaped, ca 26 mm high, without distinct tube, limb distinctly 5-lobed with 15 mm deep incisions; lower 7 mm glabrous, above this midpetaline bands hirsute outside, the lobes with an up to $2^1/_2$ mm broad thin glabrous wing on each side along the whole length. Stamens and style white, about as high as the corolla. Stamens inserted ca 3 mm above the corolla base; filaments 18 mm long, broadened to the base from 5 mm above it, the lower 7 mm glandular-hairy; anthers linear, ca $3^1/_2$ mm long. Ovary 2-celled, conical, ca 1 mm high, glabrous; style glabrous, 23 mm long; stigma biglobular, papillose. Disk annular, ca $^1/_2$ mm high. Fruit unknown.

MALAY PENINSULA, Pahang, Kemaman, Ulu Bendong, *Corner SF 30140*, fl. Nov. 1935 (SING, type).

Distribution: known only from the Malay Peninsula (Pahang).

PLANTAE A TH. HERZOGIO IN ITINERE EIUS BOLIVIENSI ALTERO ANNIS 1910 ET 1911 COLLECTAE

Pars X

COMPOSITAE (Continuatio)

ab

Angel Lulio Cabrera (La Plata, Argentina)

(Ed. die 1. IX. 1952)

ASTEREAE.

Haplopappus Cass.

Haplopappus (*Diplostephioides*) **boliviensis** Cabrera, nov. spec.

Frutex volubilis ramulis teretibus, costatis, glabris, inferne nudis cicatricosis, superne dense foliosis, 4—5 mm crassis. Folia chartacea, alterna (internodiis 2—3 mm longis), brevissime petiolata, lanceolata, apice acuta mucronulataque, basi cuneata, margine integerrima vel subdentata, utrinque glaberrima, subtus nervo mediano prominenti, venis secundariis argute reticulatis; petiolo 2—5 mm longo, lamina 7—10 cm longa, 2—2.5 cm lata. Capitula discoidea, multa, in apice ramulorum densissime corymbosa; pedicellis glabris, ca. 5 mm longis. Involucrum turbinatum, 12—15 mm longum, 5 mm crassum; bracteis papyraceis, glaberrimis, ca. 15, externis ovatis, acutis, margine subciliatis, 3—5 mm longis, 2—2.3 mm latis; internis lanceolatis, acutis, usque 15 mm longis, 1.8 mm latis. Receptaculum convexum. Flores 5, isomorphi, hermaphroditi, corolla tubulosa 10 mm longa, superne pentalobata; lobulis lanceolatis ca. 4 mm longis. Achaenia (valde inmatura), leviter compressa, minute glandulosa. Pappus biseriatus, ochraceus.

Hab.: Liane an der Waldgrenze über Tablas, 3400 m alt., Mai 1911, *n. 2186*, Bl. orange, nach Hyacinthen duftend (Typus).

A speciebus proximis bracteis involucralibus foliisque glaberrimis et capitulis 5-floris differt.

Solidago L.

Solidago microglossa DC., Prodr., 5: 332, 1836.

Hab.: In den Campos des "Lomas" am Rio Pirai, 500 m alt., Jan. 1911, *n. 1293*; in den Hügelcampos von Florida und Palissa, 900 m alt., Dec. 1910, *n. 1293*.

Distr.: America tropicalis.

Obs.: A *Solidago chilensis* Meyen foliis dense puberulis differt.

Aster L.

Aster acaulis Weddell, Chloris Andina, 1: 189, tab. 33-A, 1857.

Hab.: An sonnigen Abhängen im Tal Choquecota Chico, 4400 m alt., Okt. 1911, *n. 2347*.

Obs.: Herba pygmaea, acaulis, foliis spathulatis, sericeo-pubescentibus, capitulis solitariis sessilibus.

Aster marginatus H. B. K., Nov. Gen. et Spec. Plant., 4: 91, 1820; Weddell, Chloris Andina, 1: 188, 1857.

Hab.: An felsigen Berghängen bei Choquetanga Grande, 3600 m alt., Okt. 1911, *n. 2404*; auf Bergtriften um Samaipata, 1800 m alt., März 1911, *n. 1897b*.

Obs.: *N. 2404* specimen laxe pubescens est, caulibus adscendentibus mono-(bi-)cephalis, 10 cm altis. *N. 1897b* specimen dense pubescens est, caulibus erectis, tricephalis, 30 cm altis.

Erigeron L.

Erigeron chilensis (Spreng.) Don in Loudon, Hort. Brit.: 343, 1830 — *Conyza chilensis* Sprengel, Novi Proventus: 14, 1819.

Hab.: In der Pampa von Sta. Cruz, 450 m alt., Jan. 1911, *n. 1503a*; Pampa um Santa Cruz de la Sierra, *n. 1525*.

Distr.: S. America.

Erigeron rosulatus Weddell, Chloris Andina, 1: 193, tab. 33-C, 1857.

Hab.: Gewölbte stark verholzte Polster an steinigen Abhängen der C. Chancapiña, 4700 m alt., Okt. 1911, *n. 2356*; gewölbte stark verholzte Polster bildend an steinigen Abhängen des C. Chancapiña, 4600—4800 m alt., Okt. 1911, *n. 2359*.

Distr.: Bolivia.

Obs.: Pulvinatus, sericeo-tomentosus, foliis spathulatis, capitulis solitariis sessilibus. Stylus Asteris similis.

Erigeron senecioides Weddell, Chloris Andina, 1: 198, 1857.

Hab.: Bolivia, *n. 2503*.

Distr.: Perú, Bolivia, N. Chile, N. Argentina.

Diplostephium Kunth

Diplostephium haenkei (DC.) Weddell, Chloris Andina, 1: 203, 1857 — *Simbecline haenkei* DC., Prodr., 5: 297, 1836 — *Diplostephium affine* Weddell, Chloris Andina, 1: 203, 1857 — *Aster sejaensis* O. Kuntze, Rev. Gen. Plant., 3 (2): 131, 1898 — *Diplostephium mandenii* Rusby in Bull. N. Y. Bot. Gard., 4: 383, 1907 — *Diplostephium liaboides* Rusby, loc. cit.: 384 — *Diplostephium atropurpureum* Rusby, loc. cit.: 384 — *Diplostephium sejaense* (OK.) Blake in Contrib. U. S. Nat. Herb., 24 (3): 80, 1922.

Hab.: Kl. Bäumchen oder Baumstrauch im obersten Waldgürtel über Tablas, 3400 m alt., Mai 1911, *n. 2141*, Strahlbl. lila.

Distr.: Perú, Bolivia.

Obs.: Frutex foliis coriaceis, elliptico-lanceolatis, supra glabris, nitidis, subtus ochraceo-lanatis. Capitula magna, cymoso-corymbosa.

Chiliotrichum Cass.

Chiliotrichum diffusum (Forst.) O. Kuntze, Rev. Gen. Plant., 3 (2): 141, 1898 — *Amellus diffusus* Forster, Fasc. Plant.: 39, 1789.

Hab.: Chile, Strauch bei Pta. Arenas, Dec. 1911, *n. 2537*, Bl. weiss.

Distr.: S. Argentina et Chile.

Podocoma Cass.

Podocoma hieraciifolia (Poir.) Cass. in Dict. Scien. Nat., 42: 60, 1826 — *Erigeron hieracifolium* Poiret in Encycl. Meth., 8: 491, 1808.

Hab.: Auf steinigen Bergtriften bei Samaipata, 1800 m alt., März 1911, *n. 1897c*.

Distr.: S. Brasil, Uruguay, N. Argentina, Bolivia.

Baccharis L.

Baccharis alpina H. B. K., Nov. Gen. et Spec. Plant., 4: 48, tab. 322, 1820; Weddell, Chloris Andina, 1: 168, tab. 28, 1856.

Hab.: Zwergspalier auf Erde zwischen Felsblöcken bei der Lagune von Choquecota Chico, 4400 m alt., Okt. 1911, *n. 2346*; auf sonnigen, sandigen Wiesen des Plateaus bei Palca, 3600 m alt., Mai 1911, *n. 2078bis*.

Distr.: Ecuador, Perú, Bolivia, NW. Argentina.

Obs.: Plantae repentes caulibus gracilibus radicantibus. Folia densissima, minuta, spathulata. Capitula solitaria.

Baccharis coridifolia DC., Prodr., 5: 422, 1836; Cabrera in Rev. Mus. La Plata (N. S.) Bot., 4: 125, 1941.

Hab.: Auf Bergwiesen der Cuesta de los Monos, 1300 m alt., März 1911, *n. 1734*.

Distr.: S. Brasil, Paraguay, Uruguay, Argentina, Bolivia.

Obs.: Nom. vern.: "Romerillo".

Baccharis grandicapitulata Hieronymus in Engler, Bot. Jahrb., 36: 481, 1905.

Hab.: Strauch an der Waldgrenze über Tablas, 3400 m alt., Mai 1911, *n. 2164*.

Obs.: A typo differt petiolis tantum 1—2 mm longis, venis foliorum parce conspicuis.

Baccharis microphylla H. B. K., Nov. Gen. et Spec. Plant., 4: 53, 1820; Weddell, Chloris Andina, 1: 170, tab. 29, 1856.

Hab.: An trockenen Abhängen um La Paz häufig, 3600 m alt., Sept. 1911, *n. 2325*.

Distr.: Colombia, Perú, Bolivia.

Obs.: Frutex ramosus, glaber, foliis densis, cuneatis, 3—5-dentatis, capitulis ad apicem ramulorum glomeratis.

Baccharis nitida (R. et P.) Persoon, Syn. Plant., 2: 425, 1807 — *Molina nitida* Ruiz et Pavon, Syst. Veget. Fl. Peruv. et Chil.: 204, 1798.

Hab.: Strauch an der Waldgrenze über Tablas, 3400 m alt., Mai 1911, *n. 2184*.

Distr.: Perú, Bolivia.

Obs.: Frutex caulibus striatis, foliis alternis, elliptico-lanceolatis, uninervatis, glabris. Capitula cymosa.

Baccharis polycephala Weddell, Chloris Andina, 1: 173, 1856.

Hab.: An steinigen Abhängen des Cerro de Oruro, 3900 m alt., Sept. 1911, *n. 2444*.

Distr.: Bolivia.

Baccharis prostrata (R. et P.) Persoon, Syn. Plant., 2: 424, 1807 — *Molina prostrata* Ruiz et Pavon, Syst. Veget. Fl. Peruv. et Chil.: 204, 1798.

Hab.: Zwergspalierstrauch im Geröll am Cerro Tunari, 4500 m alt., Mai 1911, *n. 2112*; niederliegender Krüppelstrauch auf dem Plateau bei Palca Chico, 3600 m alt., Mai 1911, *n. 2125*.

Distr.: Perú, Bolivia, N. Argentina.

Obs.: Frutex pygmaeus, repens, glaber, foliis minutis, spathulatis, integris vel subtridentatis. Capitula subsolitaria.

Baccharis ulicina Hooker et Arnott in Hooker, Journ. of Bot., 3: 38, 1841; Cabrera in Rev. Mus. La Plata (N. S.) Bot., 4: 113, 1941.

Hab.: Gemeinstes Kraut auf Bergtriften und in der Dornbuschsteppe von Vallegrande bis Comarapa, 1900 m alt., April 1911, *n. 1802.*

Distr.: Bolivia, Argentina.

SENECIONEAE.

Liabum Adans.

Liabum cardenasii Cabrera in Not. Mus. La Plata, 14: 191, fig. 1, 1949.

Hab.: Strauch im obersten Waldgürtel über Tablas, 3400 m alt., Mai 1911, *n. 2149.*

Distr.: Bolivia.

Obs.: Flores albi.

Liabum jelskii Hieronymus in Engler, Bot. Jahrb., 36: 499, 1905.

Hab.: Auf Alpenwiesen über Tablas, 3400 m alt., Mai 1911, *n. 2144.*

Distr.: Perú, Bolivia.

Liabum pinnulosum O. Kuntze, Rev. Gen. Plant., 3 (2): 163, 1898.

Hab.: Im subalpinen Gebüsch bei Comarapa, 2300 m alt., April 1911, *n. 2017.*

Distr.: Bolivia.

Liabum subviride Blake in Journ. Washington Acad. Scienc., 17: 294, 1927.

Hab.: Hochstaude im Gebüsch um Incacorral, 2500 m s. m., Juni 1911, *n. 2220.*

Distr.: Bolivia.

Obs.: Folia late triangularia, utrinque glabra; capitula parva permulta. Flores aurantiacei.

Liabum uniflorum (Poepp. et Endl.) Benth. et Hook. ex Hoffmann in Engler und Prantl, Natur. Pflanzenfam., 4 (5): 285, 1894 — *Paranephelius uniflorus* Poepp. et Endl., Nov. Gen. ac Spec. Plant., 3: 42, tab. 248, 1845.

Hab.: Auf dem Gipfel des Berges über Vallegrande, 2550 m alt., März 1911, *n. 1840.*

Distr.: Perú, Bolivia.

Chersodoma Phil.

Chersodoma candida Philippi in Anal. Mus. Nac. Chile, Bot., 8: 33, 1891; Cabrera in Rev. Mus. La Plata (N. S.) Bot., 6: 348, fig. 2, 1946 — *Senecio chersodomus* Reiche in Anal. Univ. Chile, 114: 189, 1904, et Flora de Chile, 4: 261, 1905.

Hab.: Kleiner Strauch an steinigen Abhängen des Cerro Oruro, 3800 m alt., Sept. 1911, *n. 2450.*

Distr.: S. Bolivia, N. Chile, NW. Argentina.

Chersodoma diclina (Weddell) Cabrera in Rev. Mus. La Plata (N. S.) Bot., 6: 333, fig. 4, 1946 — *Senecio diclinus* Weddell, Chloris Andina, 1: 107, 1856.

Hab.: An Felsen im Tunarigebiet, 4600 m alt., Mai 1911, *n. 2087a*; unter Felsblöcken im Granitgebiet des Viloco-Hochtales, 4600 m alt., Okt. 1911, *n. 2344.*

Distr.: Perú, Bolivia, NW. Argentina.

Culcitium Humb. et Bonpl.

Culcitium neaei Sch. Bip. ex Weddell, Chloris Andina, 1: 140, 1856.

Hab.: Im Felsspalten des Viloco-Hochtales, 4800—5100 m alt., Okt. 1911, *n. 2336.*

Distr.: Perú, Bolivia.

Culcitium nivale H. B. K., Nov. Gen. et Spec. Plant., 4: 171, tab. 363, 1820; Weddell, Chloris Andina, 1: 139, tab. 23-A, 1856.

Hab.: Im Felsschutt der Cerro Jurackasa, 4800 m alt., Juni 1911, *n. 2230.*

Pseudogynoxys Cabr.

Pseudogynoxys benthami Cabrera in Brittonia, 7: 56, 1950.

Hab.: Kletterstrauch im Niederwald zwischen Awaray und Yacuiba, Argentina, 23 Okt. 1910, *n. 1039.*

Distr.: Bolivia, Paraguay, Brasil, N. Argentina.

Gynoxys Cass.

Gynoxys tablaensis Cabrera, nov. spec.

Arbuscula ramis novellis subtetragonis, dense cinereo-tomentosis, ca. 8 mm crassis. Folia opposita (internodiis 3—4 cm longis), petiolata, petiolo supra canaliculato, dense ochraceo-tomentoso, 2.5—3 cm longo; lamina ovato-lanceolata, apice acuta, basi cordata, integerrima, coriacea, supra glabra, nitida, subtus densissime ochraceo-tomentosa, venis secundariis utrinque 11—14, supra immersis, subtus prominentibus, 14—17 cm longa, 5—6 cm lata. Capitula permulta, apice ramulorum cymoso-paniculata; pedunculis dense ochraceo-tomentosis, bracteatis, ca. 5 mm longis. Involucrum campanulatum, calyculatum, 8 mm longum, 8 mm crassum, floribus disci brevius; bracteolis calyculi paucis, linearibus; bracteis involucri 8, oblongis, subobtusis, dorso dense ochraceo-tomentosis, margine scariosis. Flores lutei, dimorphi: marginales ca. 6, feminei, ligulati, tubulo 5 mm longo, ligula oblonga 5—6 mm longa, 1.5 mm lata. Flores disci 17—22, hermaphroditi, tubulosi, corolla 8 mm longa apice pentadentata: dentibus lanceolatis 1 mm longis. Styli ramuli apice triangulares, longe pilosi. Achaenia cylindracea, costata, glabra. Pappus copiosus, albus.

Hab.: Bäumchen an der Waldgrenze über Tablas, 3400 m alt., Mai 1911, *n. 2201*, Bl. gelb (Typus).

Obs.: A *G. macrophylla* Muschl. differt foliis diversis, bracteis involucri 8, nec 10—12. A *G. hypomalaca* Blake differt foliis majoribus basi cordatis, non rotundatis.

Gynoxys boliviana (Klatt) Blake in Contrib. Gray Herb. Harvard Univ., 53: 28, 1918 — *Liabum bolivianum* Klatt in Annal. K. K. Naturhist. Hofmus., 9 (3): 362, 1894.

Hab.: Strauch im Bachufergebüsch des Rio Saujana bei Calachaca, 3400 m alt., Okt. 1911, *n. 2371.*

Distr.: Bolivia.

Obs.: Cum typo identica, sed foliis inferne incano-tomentosis.

Gynoxys cochabambensis Cabrera in Not. Mus. La Plata, 14: 194, fig. 2, 1949.

Hab.: Zwergbäumchen (4 m) in subalpinen Gebüsch über Incacorral, 3200 m alt., Juni 1911, *n. 2214.*

Obs.: Folia integerrima.

Gynoxys glabriuscula Rusby in Mem. Torrey Bot. Club, 6 (1): 68. 1896.

Hab.: Zwergbäumchen in den Queuiñagehölzen der Cuesta de Duraznillos, 2700 m alt., April 1911, *n. 2025.*

Distr.: Bolivia.

Senecio L.

Senecio boliviensis Schultz Bip. in Linnaea, 34: 531, 1865—66 (nomen nudum); Klatt in Leopoldina, 24: 127, 1888.

Hab.: An schattigen Bachufern des Plateaus bei Palca, 3600 m s. m., Mai 1911, *n. 2132*; an grasigen Abhängen auf dem Plateau bei Palca, 3600 m alt., Mai 1911, *n. 2130*.

Distr.: Bolivia.

Senecio campanulatus Schultz Bip. var. **glabrescens** Cabrera, nov. var.

Hab.: Spreizend im feuchten Gebüsch über Incacorral, 2500 m alt., Juni 1911, *n. 2189*, Bl. crème.

Obs.: A var. *campanulato* differt foliis subtus laxe lanatis glabrescentibusve. Folia suprema sessilia, cordato-amplexicaulia, inferiora petiolata.

Senecio comosus Schultz Bip. in Bonplandia, 4: 52, 1856 (nomen nudum); Weddell, Chloris Andina, 1: 129, 1856.

Hab.: An Quellbächen des Jurackasa-Gebirgsstockes häufig, 3500—4000 m alt., Juni 1911, *n. 2254*.

Distr.: Perú, Bolivia.

Senecio coroicensis Rusby in Bull. New York Bot. Gard., 4: 395, 1907.

Hab.: Hochstaude im Bergwald des Rio Tocorani, 2500 m alt., Juli 1911, *n. 2275*.

Distr.: Bolivia.

Senecio dictyophlebius Greenman in Annal. Missouri Bot. Gard., 25: 801, 1938 — *Senecio volubilis* Schultz Bip., in Bull. Soc. Bot. France, 12: 80, 1865 (nomen nudum), et in Linnaea, 34: 531, 1865—66 (nomen nudum), non *S. volubilis* Hook.

Hab.: Kletterstrauch an der Waldgrenze über Tablas, 3400 m alt., Mai 1911. *n. 2183*, Bl. gelb.

Distr.: Bolivia.

Senecio evacoides Schultz Bip. in Bonplandia, 4: 52, 1856. — Weddell, Chloris Andina, 1: 105, 1856.

Hab.: An Schutthängen zwischen Choquecota Grande und Ch. Chico, 4800 m alt., Okt. 1911, *n. 2360*.

Distr.: Perú, Bolivia, N. Argentina.

Senecio glacialis Weddell. Chloris Andina, 1: 113, 1856, tab. 18-A.

Hab.: Kleiner Strauch im Geröll des Tunari-Gebietes, stark duftend, 4300—5000 m alt., Mai 1911, *n. 2098*.

Distr.: Bolivia, N. Argentina.

Senecio graveolens Weddell, Chloris Andina, 1: 111, 1856; Cabrera in Lilloa, 15: 99, fig. 22, 1949.

Hab.: Zwergstrauch mit fleischigen Blättern und brüchigen Asten, Viloco-Hochtal, 4600—4800 m alt., Okt. 1911, *n. 2354*.

Distr.: Bolivia, N. Chile, NW. Argentina.

Senecio humillimus Schultz Bip. in Bonplandia, 4: 55, 1856; Weddell, Chloris Andina, 1: 104, 1856.

Hab.: Ausgedehnte Rasen an Schutthängen zwischen Choquecota Grande und Ch. Chico, 4800 m alt., Okt. 1911, *n. 2361*.

Distr.: Perú, Bolivia.

Senecio myrianthus Klatt in Leopoldina, 24: 127, 1888.

Hab.: 4—5 m hoch. Bäumchen an der Waldgrenze über Tocorani, 3200 m alt., Juli 1911, *n. 2279*, Strahlbl. weiss.

Distr.: Bolivia.

Obs.: Folia quam in descriptione majora.

Senecio pulviniformis Hieronymus in Engler, Bot. Jahrb., 21: 359, 1896; Cabrera in Lilloa, 15: 218, fig. 74, 1949.

Hab.: Kleine Polster bildend auf feuchtem Sand in Schneetälchen des Cerro Tunari, 5000 m alt., Mai 1911, *n. 2085a*.

Distr.: Bolivia, N. Chile, NW. Argentina.

Obs.: *S. humillimo* Sch. Bip. similis, sed achaenia sericeo-pubescentia.

Senecio reicheanus Cabrera in Lilloa, 15: 403, fig. 147, 1949.

Hab.: Kleiner Strauch an steinigen Abhängen des Cerros de Oruro, 3800 m alt., Sept. 1911, *n. 2458*, Bl. gelb.

Distr.: Bolivia; N. Chile.

Senecio repens DC., Prodr., 6: 423, 1837; Weddell, Chloris Andina, 1: 90, tab. 19-A, 1856 — *Cacalia humilis* H. B. K., Nov. Gen. et Spec. Plant., 4: 166, 1820 — *Senecio rhizocephalus* Turcz. in Bull. Soc. Natur. Mosc., 24: 210, 1851.

Hab.: Auf schwarzem Humus an Bachrändern im obersten Llavetal, 4100 m alt., Mai 1911, *n. 2108*.

Distr.: Ecuador, Perú, Bolivia.

Senecio rhizomatus Rusby in Mem. Torrey Bot. Club, 6 (1): 66, 1896 — *Senecio erosus* Weddell, Chloris Andina, 1: 228, 1857 (non L.f.).

Hab.: Im Schatten der Felsblöcke am Westhang des Pta. de San Miguel, 4700 m alt., Mai 1911, *n. 2119*.

Distr.: Bolivia.

Senecio tabacifolius Rusby in Bull. New York Bot. Gard., 4: 396, 1907.

Hab.: Klimmend im Gebüsch über Incacorral, 2600 m alt., Juni 1911, *n. 2243*, Bl. weiss.

Distr.: Bolivia.

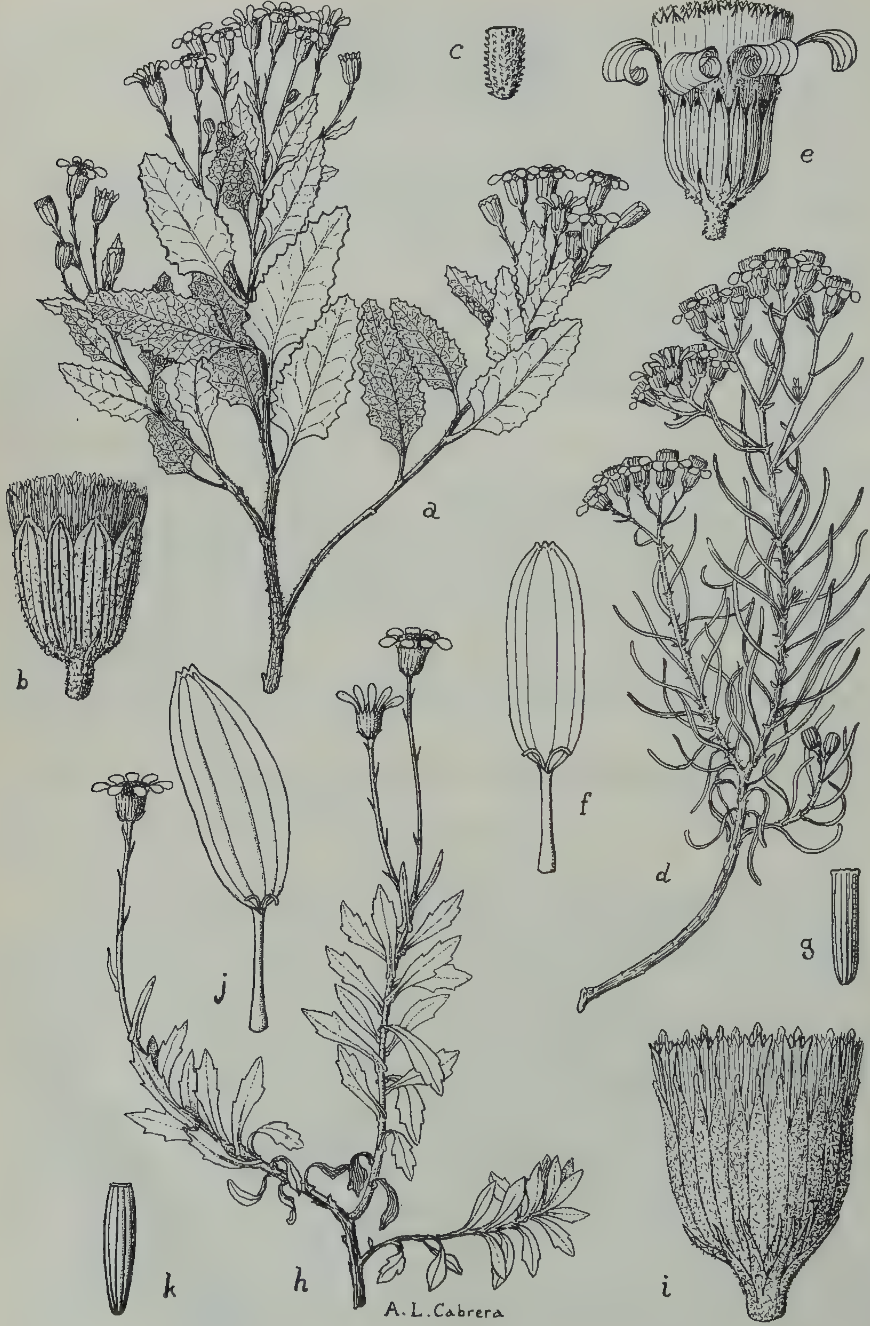
Senecio tephrosioides Turczaninow in Bull. Soc. Natur. Mosc., 24: 92, 1851.

Hab.: Auf moorigen Alpenwiesen über Tablas, 3400—3700 m alt., Mai 1911, *n. 2172*.

Distr.: Ecuador, Perú, Bolivia.

Senecio viridilacus Cabrera, nov. spec. (fig. 1, i—k).

Suffrutex caulibus adscendentibus, vetustis lignosis, cicatricosis, glabris, novellis teretibus, 1—2 mm crassis, incano-tomentosis, inferne dense foliosis, superne subnudis scapiformibus, monocephalis, 10—15 cm altis. Folia alterna (internodiis 1—2 mm longis), sessilia, oblanceolata, apice acuta, ad basem dilatatam saepe amplexicaulem attenuata, margine cum 1—2 dentibus crassis munita, utrinque incano-tomentosa, 12—35 mm longa, 3—8 mm lata. Folia superiora distantia, linearia, basi auriculata. Capitula radiata, solitaria (raro 2). Involucrum campanulatum, calyculatum, 6—7 mm altum, 6 mm crassum, floribus disci parce brevius. Bracteolae calyculi multae, lineares, incano-tomentosae vel glabrescentes, 3 mm longae. Bracteae involucrales 18—20, lineari-oblongae, apice longe attenuatae, dorso tomentosae vel glabrescentes. Flores lutei, dimorphi: marginales 10—12, feminei, ligulati, tubo 4 mm longo, ligula elliptica, apice tridentata, 8—9 mm longa, 2—3 mm lata. Flores disci multi, hermaphroditi, corolla tubulosa 6—7 mm longa, apice pentadentata; dentibus deltoideis 0.5 mm longis.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A.L.Cabrera

Styli rami apice truncati papillosi. Achaenia cylindracea, costata, glabra, 3.5 mm longa. Pappus albus.

Hab.: An felsigen Stellen eines Graskopfes am Kamm der Laguna Verde bei Comarapa, 2600 m alt., April 1911, *n. 1943* (Typus); Cuesta de Duraznillos, 2700 m alt., April 1911, *n. 2024*.

Obs.: *S. pensili* Greenm. affinis, sed caulibus monocephalis et foliis angustioribus.

Senecio cochabambensis Cabrera, nov. spec. (fig. 1, d—g).

Frutex 30—50 cm altus, ramosus, ramulis teretibus, 1—2.5 mm crassis, inferne glabris, cicatricosis, superne albo-lanatis, dense foliosis. Folia alterna (internodiis 1 mm longis), in axillis cum fasciculis foliorum minorium munita, sessilia, linearia, apice acuta, basi parce attenuata, auriculata (auriculis linearibus brevibus), margine integra, revoluta, supra lanuginosa, demum glabra, subtus persistenter albo-tomentosa, 20—35 mm longa, 1(—2) mm lata. Capitula multa, radiata, in cymis corymbiformibus terminalibus disposita; pedunculis lanosis, 1—2 bracteolatis, 5—8 mm longis. Involucrum campanulatum, calyculatum, 4.5—5 mm altum, 5 mm crassum, floribus disci brevius; bracteolis calyculi linearibus, dorso lanosis, apice obscuris, 1—2 mm longis; bracteis involucri ca. 13, oblongis, acutis, apice penicillatis sphacelatisque, dorso glabrescentibus. Flores lutei, dimorphi: marginales ca. 10, feminei, ligulati, tubulo 2 mm longo, ligula elliptica, apice tridentata, 6 mm longa, 2 mm lata. Flores disci ca. 30, hermaphroditi, corolla tubulosa 6 mm longa, apice breviter pentadentata: dentibus 0.4—0.5 mm longis. Antherae basi obtusae. Styli rami apice truncati papillosi. Achaenia cylindracea, costata, glabra, 2.5 mm longa. Pappus albus, 6 mm longus.

Hab.: An sonnigen Schieferfelsen im Llavetal bei Cochabamba, 3700 m alt., Mai 1911, *n. 2093* (Typus).

Obs.: *S. argophylloidei* Griseb. similis, sed capitulis minoribus, achaeniis glabris et foliis basi auriculatis.

Senecio kosterae Cabrera, nov. spec. (fig. 1, a—c).

Frutex ramis fastigiatis, gracilibus, costatis, superne lanuginosis foliosis, inferne glabris nudis, 1—2 mm crassis. Folia alterna (internodiis 5—15 mm longis), petiolata, chartacea, petiolo lanoso 6—10 mm longo, lamina ovato-lanceolata vel ovato-deltoidea, obtusa, apice mucronulata, basi truncata in petiolo leviter decurrenti, margine profunde dentata: dentibus utrinque 8—14, deltoideis vel trapezoidalibus, mucronulatis, supra glabra, subtus dense albo-tomentosa, vena centrali prominente, secundariis utrinque 10—14, 35—45 mm longa, 12—20 mm lata. Capitula multa, radiata, longe pedunculata, in cymis corymbiformibus terminalibus foliosis disposita; pedunculis lanosis, bracteolatis, 20—30 mm longis. Involucrum campanulatum, subecalyculatum, 5—6 mm altum, 5—6 mm crassum, floribus disci brevius; bracteis involucralibus 8, oblongis, apice obtusis vel subacutis, tri- vel tetranervatis, dorso lanuginosis, margine membranosis, 1.5—

Fig. 1 — *Senecio kosterae* Cabr.: *a*, ramulus (× ½), *b*, involucrum (× 3), *c*, achaenium (× 5); *Senecio cochabambensis* Cabr.: *d*, ramulus (× ½), *e*, capitulum (× 3), *f*, corolla floris feminei (× 5), *g*, achaenium (× 5); *Senecio viridilacus* Cabr.: *h*, ramulus (× ½), *i*, involucrum (× 3), *j*, corolla floris feminei (× 5), *k*, achaenium (× 5).

2 mm latis. Flores lutei, dimorphi: marginales 8, feminei, ligulati, tubulo 4 mm longo, ligula 6 mm longa, 2 mm lata. Flores disci ca. 20, hermaphroditi, corolla tubulosa 6 mm longa, apice pentadentata: dentibus 0.6 mm longis cum vena media. Styli rami apice truncati et coronula pilorum terminati. Achaenia cylindracea, costata, brevissime papillosa, 2 mm longa. Pappus albus, 6 mm longus.

Hab.: An steinigen Abhängen zwischen Uyati und Totora, 2600 m alt., April 1911, *n. 2040* (Typus).

Obs.: Species pulcherrima in honore Dr. Joséphine Th. Koster nominata.

Senecio leuceria Cabrera, nov. spec. (fig. 2, a—d).

Suffrutex 20—30 cm altus, basi ramosus, caulibus erectis, teretibus, subalatis, lanuginosis, usque ad apicem dense foliosis. Folia alterna (internodiis 2—6 mm longis), in alis angustissimis decurrentia, 30—50 mm longa, 20—25 mm lata, supra glabra, subtus albo-tomentosa, ambitu elliptica, profunde pinnatisecta, segmentis 4—5-jugis, lanceolatis, acutis, cum 1—2 dentibus munitis, 5—10 mm longis, 2—5 mm latis; segmento terminali acuto majore. Capitula multa, radiata, in cymis corymbiformibus apice caulis disposita; pedunculis lanosis, 5—10 mm longis. Involucrum campanulatum, calyculatum, floribus disci brevius, 4.5—5 mm altum, 4—5 mm crassum; bracteolis calyculi paucis, linearibus, brevibus; bracteis involucri ca. 13, lineari-oblongis, apice acutis, glabris, dorso leviter granulosis. Flores lutei, dimorphi: marginales ca. 7, feminei, ligulati, tubulo 2 mm longo, ligula elliptica 5 mm longa, 1.2 mm lata. Flores disci 17—20, hermaphroditi, corolla tubulosa 10-nervata, 5—6 mm longa, apice breviter pentadentata: dentibus deltoideis 0.5—0.6 mm longis. Achaenia cylindracea, costata, dense sericeo-pubescentia, 2—2.5 mm longa. Pappus albus.

Hab.: An einem sonnigen Felsgrat bei Comarapa, 2400 m alt., April 1911, *n. 1908* (Typus).

Obs.: Species a forma foliorum et capitulis minutis permultis distinctissima.

Senecio herzogii Cabrera, nov. spec. (fig. 2, i—m).

Frutex volubilis divaricato-ramosus, ramis vetustis glabris, teretibus, 2.5—3 mm crassis; ramis novellis flexuosis, tomento laxo caduco tectis. Folia alterna (internodiis 2—5 cm longis), petiolata, petiolo 10—18 mm longo, lamina subcoriacea, ovato-lanceolata, apice acuminata, basi rotundata, margine cum dentibus brevibus distantibus munita, supra glabra, subtus dense albo-tomentosa, venis secundariis ca. 12-jugis, supra inmersis, subtus prominentibus, 5.5—7 cm longa, 2—2.5 cm lata. Capitula multa, discoidea, subsessilia, in glomerulis vel pseudospicis terminalibus axillaribusque disposita. Involucrum campanulatum, calyculatum, 5 mm altum, 4 mm crassum, floribus brevius; bracteolis calyculi brevibus, tomentosis; bracteis involucri ca. 8, oblongis, apice deltoideis ciliatis, dorso tomentosis glabrisve. Flores dimorphi, lutei: marginales 2—4, feminei, corolla tubulosa breve, 4.5 mm longa, tetralobata, stylo longe exserto. Flores disci 8—10, hermaphroditi, corolla tubulosa 6 mm longa, 10-nervata, apice pentadentata: dentibus lanceolatis 1—1.2 mm longis. Achaenia (inmatura) cylindracea, costata, glabra. Pappus albus.

Hab.: Kletternd im Bergwald bei Choquetanga Grande, 3300 m alt., Okt. 1911, *n. 2145* (Typus).

Obs.: *S. cuzcoensi* Cabr. et *S. oronocensi* DC. affinis, sed foliis subtus albo-tomentosis, involucro glabrescente et floribus paucioribus.

In honore Dr. Th. Herzog nominata.

Senecio tablensis Cabrera, nov. spec. (fig. 2, e—h).

Frutex volubilis caulibus teretibus, striatis, glabris, 3—4 mm crassis. Folia alterna (internodiis 10—15 mm longis), petiolata, subcarnosa, petiolo ca. 5 mm longo, lamina ovata vel elliptica, apice obtusa submucronulata, basi attenuata vel rotundata, margine integerrima conspicue revoluta, utrinque glaberrima, venis secundariis 5—7-jugis, 35—50 mm longa, 20—25 mm lata. Capitula multa, radiata, in cymis corymbiformibus terminalibus disposita; pedunculis leviter glanduloso-pubescentibus. Involucrum campanulatum, calyculatum, 8 mm altum, 8 mm crassum, floribus disci brevius; bracteolis calyculi lanceolatis, leviter glanduloso-pubescentibus, 2—3 mm longis; bracteis involucri ca. 13, oblongis, apice deltoideis ciliatisque, dorso glabris vel leviter glanduloso-pubescentibus. Flores lutei, dimorphi: marginales feminei, ligulati, tubulo 5 mm longo, ligula elliptica 6 mm longa, 2 mm lata. Flores disci 30—35, hermaphroditi, corolla tubulosa 10-nervata, 8 mm longa, apice pentadentata: dentibus lanceolatis 1—1.2 mm longis. Achaenia cylindracea, costata, glabra, 4 mm longa. Pappus albus.

Hab.: Liane and der Waldgrenze über Tablas, 3400 m alt., Mai 1911, *n. 2204.*

Werneria Kunth

Werneria dactylophylla Schultz Bip. in Bonplandia, 4: 53, 1856; Weddell, Chloris Andina, 1: 87, 1856.

Hab.: Gestielte Polster bildend im Geröll der Cerro Tunari, 4800—5000 m alt., Mai 1911, *n. 2094* (Det. Rockhausen).

Distr.: Perú, Bolivia.

Werneria ciliolata A. Gray in Proceed. Amer. Acad. Arts and Scien., 5: 140, 1861 — *Werneria juniperina* Hieronymus in Engler, Bot. Jahrb., 21: 364, 1896 — *Werneria lycopodioides* Blake in Journ. Washington Acad. of Scien., 18: 493, 1928.

Hab.: Auf feuchtem Sand des Schneetälchen im Viloco-Hochtal, 4800—5100 m alt., Okt. 1911, *n. 2342* (Det. Rockhausen).

Distr.: Perú, Bolivia, N. Chile.

Werneria nubigena Kunth in H. B. K., Nov. Gen. et Spec. Plant., 4: 193, 1820.

Hab.: In steilen Grashängen des Cerro Sipascoya, 3500 m alt., April 1911, *n. 2047* (Det. Rockhausen).

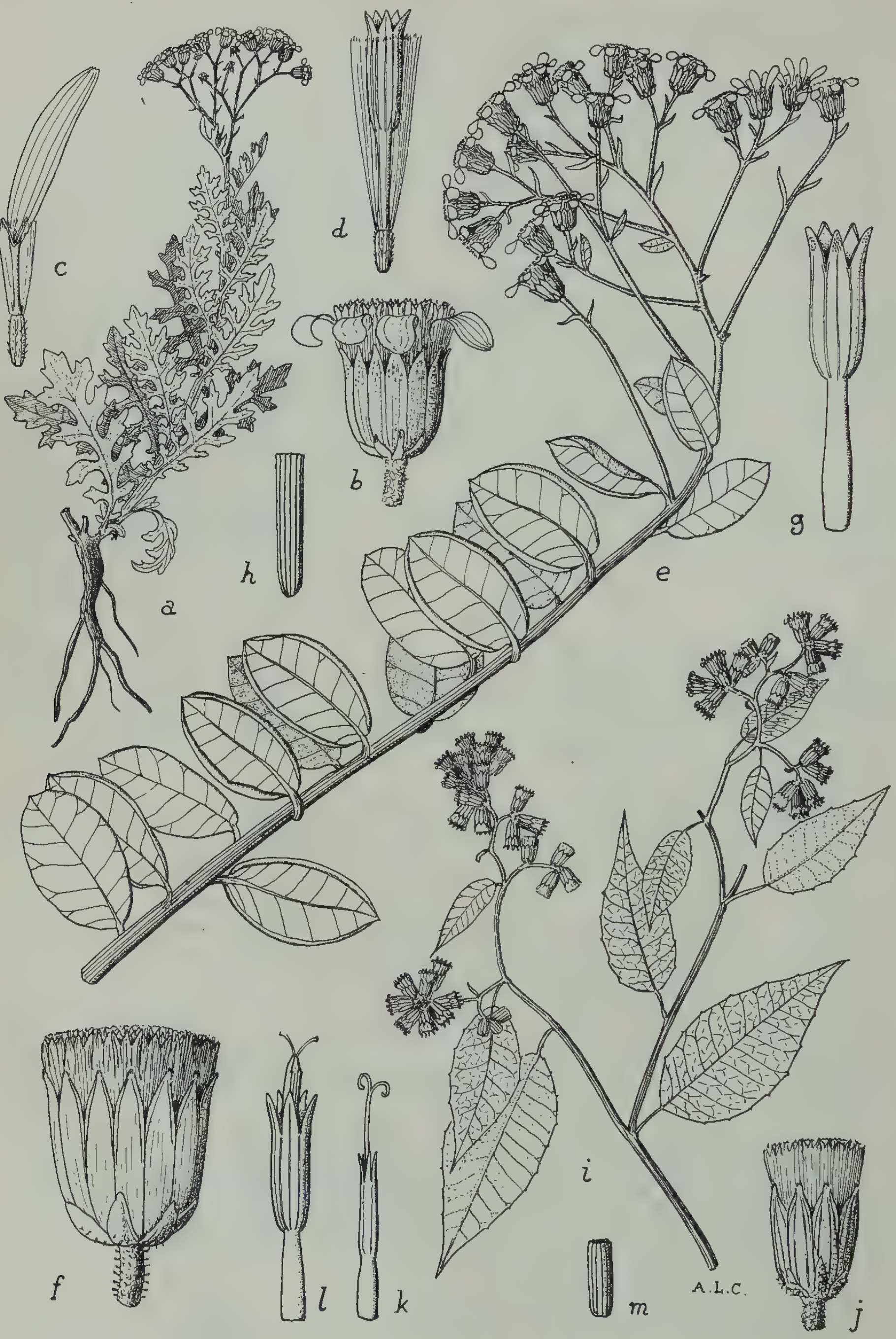
Distr.: Ecuador, Perú, Bolivia, Guatemala.

Werneria villosa A. Gray in Proceed. Amer. Acad. Arts and Scien., 5: 139, 1861 — *Werneria acerosifolia* Hieronymus in Engler, Bot. Jahrb., 21: 363, 1896 — *Werneria caulescens* Grisebach in Goett. Abhandl., 24: 208, 1879.

Hab.: Auf kurzgrasigen Alpenwiesen im obersten Llavetal, 4200 m alt., Mai 1911, *n. 2105* (Det. Rockhausen).

Distr.: Perú, Bolivia, NW. Argentina.

Werneria pygmaea Gillies ex Hook. et Arn. in Hooker, Journ. of Bot., 3: 348, 1841.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Hab.: Auf moorig-sandigen Wiesen des Plateaus bei Palca, 3600 m alt., Mai 1911, *n. 2178* (Det. Rockhausen); Rasenbildend auf mageren Triften am Tunarisee, 4250 m alt., Mai 1911, *n. 2087* (Det. Rockhausen).

Distr.: Venezuela, Colombia, Ecuador, Perú, Chile, Bolivia, Argentina.

Werneria orbignyana Weddell, Chloris Andina, 1: 85, 1856.

Hab.: Lockere Rasen bildend im Geröll des Cerro Tunari, 4700 m alt., Mai 1911, *n. 2095* (Det. Rockhausen).

Distr.: Perú, Bolivia.

Werneria spathulata Weddell, Chloris Andina, 1: 85, tab. 17-A, 1856.

Hab.: In Quellrinnen der hochandinen Region bei Chojñacota, 4800 m alt., Okt. 1911, *n. 2437* (Det. Rockhausen).

Distr.: Perú, Bolivia, Chile.

Werneria strigosissima A. Gray in Proceed. Amer. Acad. Arts and Scien., 5: 140, 1861 —*Werneria setosa* Weddell ex Schultz Bip., in Linnaea, 34: 530, 1865—66 — *Werneria boraginifolia* O. Kuntze, Rev. Gen. Plant., 3 (2): 184, 1898.

Hab.: Auf moorig-sandigen Triften des Plateaus bei Palca, rasenbildend, 3600 m alt., Mai 1911, *n. 2135*; auf kurzgrasigen mageren Triften des Cerro de Palca, 4600 m alt., Mai 1911, *n. 2089a* (Det. Rockhausen).

Distr.: Perú, Bolivia.

HELIANTHEAE.

Tridax L.

Tridax boliviensis (Wedd.) Fries in Arkiv for Bot., 5 (13): 21, 1906 — *Mandonia boliviensis* Weddell in Bull. Soc. Bot. France, 11: 51, tab. 1, 1864.

Hab.: An steinigen Stellen bei Vallegrande, 2000 m alt., März 1911, *n. 1814*; Strauch in den Geröllalluvionen der Ebene Cochabamba, 2800 m alt., Mai 1911, *n. 2076bis*.

Distr.: Bolivia.

Viguiera H. B. K.

Viguiera australis Blake in Contr. Gray Herb. Harv. Univ. N. S. III, 54, 1918, 148.

Hab.: Hochstaude an Wegrändern und im Gebüsch der Ebene von Cochabamba, 2700 m alt., Mai 1911, *n. 2063* (Det. J. Th. Koster).

Distr.: Bolivia.

Obs.: Hoc specimen cum descriptione satis congruit, sed differt foliis ad 14 cm longis, ad 18 cm latis, floribus radii ca. 10, squamellis pappi ca. 6.

Fig. 2 — *Senecio leuceria* Cabr.; *a*, pars plantae (× ½), *b*, capitulum (× 3), *c*, flos femineus (× 5), *d*, flos hermaphroditus (× 5); *Senecio tablensis* Cabr.: *e*, ramulus (× ½), *f*, involucrum (× 3), *g*, corolla floris hermaphroditi (× 5), *h*, achaenium (× 5); *Senecio herzogii* Cabr.: *i*, ramulus (× ½), *j*, capitulum (× 3), *k*, corolla floris feminei (× 5), *l*, corolla floris hermaphroditi (× 5), *m*, achaenium (× 5).

REVISION OF THE LICHENS OF THE NETHERLANDS
II. PHYSCIACEAE

by

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(Rijksherbarium, Leiden)

(Issued 1. IX. 1952)

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CONTENTS.

Page
ACKNOWLEDGMENTS 206
INTRODUCTION 207
1. Again the taxa below the rank of species 207
2. Comment on the distribution of the Physciaceae in the Netherlands . . 208
TAXONOMICAL PART 209
Physciaceae 209
1. Anaptychia 209
2. Physcia 215
References concerning the geographical distribution of the Physciaceae in Europe . 280
Index 285

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INTRODUCTION.

1. Again the taxa below the rank of species.

In my paper on *Parmeliaceae* (in Blumea, vol. 6, 1947) some remarks have been made concerning the taxa below the rank of species (p. 3—4), one of them being the statement that I was to try to hold an intermediate course between those authors accepting multitudes of varieties and forms, and others abandoning them all. In the eyes of both I may have failed.

In the present paper I am going to alienate myself still farther from the former group of authors in reducing varieties to forms and doing away with many other forms. Although in a way this contradicts my inclination towards a meticulous classification in my former paper, it should be borne in mind that not all genera in lichenology can be treated alike. I still believe in varieties and forms — considering e. g. *Parmelia physodes* a very good illustration — but on the other hand I am well aware now that in following Hillmann, whom I shall always gratefully remember for his kind help during the early days of my lichenological training, I have been decidedly all too punctilious.

Some lichenological authors have been or still are too quick in describing forms which properly speaking fall within the limits of variability of the type form. Furthermore, too many forms have been described as varieties or raised to varietal rank. To my mind, a variety should be the taxon in which genetic factors cause it to be different from the type variety, whereas in the case of a form it is the environmental factors which determine the difference from the type form. As far as I am aware little or no proof has ever been given of the genetic relationship (or, better, genetic difference) in any set of variety and type variety, but, considering the complex nature of the lichens, it remains to be seen whether one may expect a definite proof anyway. For the time being, therefore, it is subject to personal views whether any taxon differing from the type specimen is considered a variety or a form. Some authors content themselves with calling a taxon a variety, if the differences are deemed great (important) enough; others, working with extremely polymorphous species, unite such "Formenkreise" in varieties as to obtain a more convenient or practicable survey. Inherent with this method, however, is the danger of exaggeration, of overemphasising the importance of certain characters. Now, I think that especially in *Physciaceae* some characters show so many intergradations that it would be exaggeration indeed for the taxa based upon them to be called varieties.

In agreement to Art. 28 bis of the International Rules of Botanical Nomenclature as sanctioned by the Botanical Congress at Stockholm, the type form has been here designated by the repetition of the specific epithet without the citation of an author's name.

2. Comment on the distribution of the Physciaceae in the Netherlands.

For a taxonomic treatise like the present paper, it is common use to enumerate all indigenous specimens examined. Yet, I shall deviate from this practice, mainly under the pressure of the appalling costs of printing which long lists of quotations would entail. In the case of common species I have therefore omitted such lists, commenting under the head of "Ecology and distribution in the Netherlands" in what habitats and in what parts of the country the species concerned has been reported or is most likely to be found.

TAXONOMICAL PART.

Chacun pense trouver le "criterium" et ce criterium varie avec chacun.

M. Potron in Bull. Soc. Mycol. France, vol. 66, 1950, p. 240.

PHYSCIACEAE.

A. Zahlbr. in Engler-Prantl, Die natürl. Pflanzenfam., vol. 1, pars 1*, 1907, p. 234 et ed. 2, vol. 8, 1926, p. 256; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 41.

Thallus foliaceous or more rarely fruticose, with a dorsiventral or radiate structure, closely appressed to loosely adhering, ascendant to pendulous, usually attached to the substratum by rhizinae. Lobes stratified, corticated, containing *Protococcaceous* gonidia. *Apothecia* laminal or marginal, sessile or shortly pedicellate, orbicular, (lecideoid or) lecanoroid. Asci octosporous. *Spores* some shade of brown, 2-celled (more rarely 4-celled or paucilocular-muriform), with thickened cell-wall. Paraphyses simple or branched, especially towards their apices. *Pycnidia* with endobasidial, septate fulcra. *Pycnoconidia* colourless, short and straight, or rarely elongate and curved (description somewhat altered after Zahlbruckner and Lynge; family-characters which do not apply to the indigenous species have been put between brackets).

Key to the genera.

(After Lynge, l. c., p. 41)

1a. Upper cortex plectenchymatous, with the hyphae parallel to the surface . . . 1. **Anaptychia** Körb.

1b. Upper cortex either plectenchymatous, with the hyphae perpendicular to the surface, or paraplectenchymatous . . 2. **Physcia** (Schreb.) Th. Fr. em. Vain.

1. ANAPTYCHIA Körb.

in Mass., Memor. Lichenogr., 1853, p. 33; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 13; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 704 et vol. 10, 1940, p. 656 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 41.

Thallus foliaceous or fruticose, loosely adhering to ascending, deeply incised, usually attached to the substratum by means of rhizinae. Lobes dorsiventrally flattened, plane or convex and with the underside canaliculate, often with marginal cilia, stratified, with an upper cortex, not always with a lower cortex. Upper cortex more or less cartilaginous, densely plectenchymatous, consisting of conglutinate hyphae parallel to the surface. Gonidia bright green (*Protococcus* Ag.), arranged in a layer under the upper cortex or also under the lower cortex. Medulla plectenchymatous, composed of leptodermatous hyphae. Lower cortex, if present, similar to the upper one. *Apothecia* laminal or marginal, lecanoroid, discoid, with orbicular, dark-coloured, naked or pruinose disc. Asci 8-spored. *Spores* brown, ellipsoidal, 2-celled, with thickened cell-walls. Paraphyses conglutinate, often furcate at their apices. Hypothecium colourless. *Pycnidia* immersed in the thallus and flush with the surface or located in distinct warts and prominent. Fulcra endobasidial, articulated. *Pycnoconidia* colourless, short, straight, cylindrical (description after Zahlbruckner and Lynge).

Remarks. As Körber already commented in a note (Syst. Lich. German., 1855, p. 49), his newly created genus *Anaptychia* had been adopted by Massalongo, to be sure, but this author did not sufficiently recognise its character, adding considerably to the general confusion by mixing up species of the genus *Physcia* (which at that time was still called *Parmelia*).

In Act. Bot. Fenn., vol. 33, 1943, p. 41, Räsänen subdivided the genus into two new sections, viz. sect. *Melancholia* (thallus dark, K —) and sect. *Albidopallidae* (thallus pallid, K + yellowish).

According to their dark colour and negative reaction to K, the species mentioned in the present paper would belong to the former section, but it should be noted that for the publication to be valid Art. 38 of the International Rules of Botanical Nomenclature explicitly requires the name of any new group of plants to be accompanied by a Latin diagnosis.

Key to the species.

(After Lynge, l. c. p. 42)

1a. Thallus fruticose. Lobes loosely adhering, ciliate, grey in various shades . . . **1. A. ciliaris** (L.) Körb.
1b. Thallus foliaceous. Lobes closely appressed, without marginal cilia, brown in various shades . . . . **2. A. fusca** (Huds.) Vain.

1. **Anaptychia ciliaris** (L.) Körb. in Mass., Memor. Lichenogr., 1853, p. 35; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 13; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 707 et vol. 10, 1940, p. 656 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 43 — *Lichen ciliaris* L., Spec. Pl., vol. 2, 1753, p. 1144 — *Parmelia ciliaris* Ach., Meth. Lich., 1803, p. 255; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 128.

Exsiccata: Breutel, Fl. Germ. exs., no 309; Claud. et Harm., Lich. Gall. exs., no 23; Delise, Lich. France, ed. I, no 14; Desmazières, Pl. Cryptog. Nord France, no 40; idem, Pl. Cryptog. France, ed. II, no 423; Elenkin, Lich. Fl. Ross., no 85a—c; Erb. Crittog. Ital., no 162; Floerke, Deutsche Lich., no 152; Fl. exs. Austro-Hung., no 343; Funck, Cryptog. Gew. Fichtelgeb., no 161; Hepp, Flecht. Europ., no 168; Malbranche, Lich. Normand., no 24; Marcucci, Un. Itin. Cryptog. 1866, no 24; Massalongo, Lich. Ital. exs., no 39; Rabenhorst, Lich. Europ., no 63; Räsänen, Lichenoth.

Fenn. I, no 16; Reichenb. et Schub., Lich. exs., no 38; Schaerer, Lich. Helv. exs., no 388; Stenhammar, Lich. Suec. exs., no 42.

Iconography: Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tab. 30, fig. 9; Fink in Contrib. United States Nation. Herb., vol. 14, pars 1, 1910, tab. 47, fig. A et Lich. Fl. United States, 1935, tab. 47, fig. B; Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 45—54, fig. 273—281, 284—286, 290—318; Lynge in Bergens Mus. Aarb., 1910, no 9, tab. 4, fig. 5 et in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 3, fig. 1, 3; Migula, Kryptog.-Fl. Deutschl., vol. 4, pars 1, 1929, tab. 1, fig. 3; Schaerer, Enum. Crit. Lich. Europ., 1850, tab. 2, fig. 1; Smith et Sowerby, Engl. Bot., vol. 19, 1804, tab. 1352; Wulf. in Jacquin, Collect. Bot., vol. 4, 1790, tab. 13, fig. 1.

Macroscopical description — Thallus fruticose, wide-spreading, up to some 10 cm in diam., erect to subpendulous, attached to the substratum by cilia, deeply incised. Lobes fairly rigid, discrete, more or less stellate at the circumference, growing more entangled towards the centre of the thallus, rather short and broad to elongate and almost linear, up to several cm long, 1—2 mm broad, narrower in some forms, usually richly furcate or irregularly pinnatifid, convex, with involute, entire margins. Tips more or less broadened and fan-shaped, incised, terminating in two or more cilia. Cilia marginal and terminal, 2—5 mm long, simple or more rarely furcate, concolorous with the thallus, but growing darker to almost black towards their apices, partly acting as haptera and fastening the thallus to the substratum. Upper surface of the lobes light grey, grey-brown to dark grey (greenish when moistened), somewhat tanned at the tips, dull, minutely tomentose-felty, faintly indented or lengthways striate, without *soredia* or *isidia*, but with age getting more and more knobbly with warts, part of which contain pycnidia. Lower side of the lobes white to dirty white, dull, felty, canaliculate, distinctly lengthways striate and irregularly veined, the veins indicating the corticated parts, without rhizinae. *Microscopical description* — Upper cortex colourless with a dark exterior zone, very irregularly developed, densely plectenchymatous, with the hyphae parallel to the surface and partly projecting outward, forming the tomentum, 50—180 μ, sometimes connected with the underside of the lobe by strands of plectenchymatous tissue. Gonidia bright green, spherical, 9—15 μ, arranged in a layer of 30—75 μ, or in clusters under the upper cortex or deeply penetrating into it. Medulla colourless, white in reflected light, fairly densely plectenchymatous, 120—180 μ, consisting of leptodermatous hyphae. Lower cortex only partially developed, especially well-developed near the margins of the lobes, colourless, densely plectenchymatous, with the hyphae parallel to the surface, gradually passing into the medulla, 30—100 μ. *Apothecia* abundant in earlier days, rare at present, laminal or marginal, sessile or pedicellate with a stalk of 2 mm, deeply cup-shaped to discoid, usually 3—5 mm in diam., sometimes attaining as much as 7 mm. Amphithecium concolorous with the thallus, dull, minutely tomentose, smooth. Margin persistent, entire, crenate or laciniate. Disc plane, becoming wavy with age, dull, black-brown or light caesio-pruinose. Epithecium brown, hypothecium yellowish, with a gonidial layer underneath. Hymenium colourless, 150—170 μ. Asci cylindrical or somewhat clavate, 30—35 × 110—135 μ, 8-spored. *Spores* dark brown, 2-celled, constricted in the centre, ellipsoidal, straight or curved, thick-walled, with rounded or acute apices, and with coarse episporium, 18—24 × 40—45(—54) μ. Paraphyses branched towards their apices, septate, little or not conglutinate, slightly incrassate at the apices. *Pycnidia* usually abundant, immersed in the upper side of the thallus or in small warts which are concolorous with the thallus or brownish black, spherical or pyriform, 185—350 × 250—380 μ. Perifulcrium colourless or brown, ostiolum brownish or black. *Pycnoconidia* colourless, cylindrical, straight, 1—1.5 × 3—5 μ. *Chemical reactions* — Upper cortex and medulla remain unaffected by the usual reagents, it looks, therefore, as if Zopf when reporting the presence of atranorine (Flechtenstoffe, 1907, p. 415) has had heterogeneous material for investigation.

Ecology and distribution in the Netherlands. *Anaptychia ciliaris* is a corticolous species which has been found on fruit trees, *Fagus, Pinus* (!), *Salix,* and most frequently on *Populus, Quercus* and *Ulmus.* It is a decidedly nitrophilous species preferring well-exposed habitats even if in close proximity of farm-yards. Probably, however, it stands present-day conditions along our modern highways much less than most other nitrophilous species, and this, together with the gradual disappearance of our old way-side trees, may account for the comparative rareness of the species which certainly was very common in former times. Also the small, blackish, stunted and mostly sterile specimens we find to-day, poorly contrasting with the beautifully developed, richly apotheciferous specimens of earlier days, clearly indicate that *A. ciliaris* feels ill at home in a mechanised and industrialised country. The best chances of finding the species are on trees along remote country-roads away from highway traffic and industrial centres, as for instance in the north-eastern provinces.

Distribution in Europe. According to the records in literature, *A. ciliaris* is a wide-spread species in Europe.

Variability. Of the various forms described in *A. ciliaris* only a few may be recognized among the indigenous specimens, but they are of minor importance.

f. *agriopa* (Ach.) Boist. (A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 713 et vol. 10, 1940, p. 656; Lynge, l. c., p. 47) with its short and broad lobes which have somewhat hand-shaped tips seems to be a form thwarted in its normal growth by unfavourable environmental conditions.

In some cases the lobes become strongly distorted by numerous, large, bullate warts which in part contain one or more pycnidia. This stage has been called f. *verrucosa* (Ach.) Boist. (A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 715; Lynge, l. c., p. 46).

It is a common feature in *ciliaris* to find the apothecial margin beset with secondary laciniae. It is much less common, however, to find those laciniae tapering into long cilia, a stage which has been designated f. *actinota* (Ach.) Arn. (A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 712 et vol. 10, 1940, p. 656; Lynge, l. c., p. 47). Genuine *actinota* has not been found in this country, only transitional stages between it and f. *ciliaris* being known.

Specimens examined; only material not older than 25 years has been considered.

Groningen: Groningen, 21 IX 1950, *Barkman* (L); Haren, Harendermolen, IV 1941, *Van Veen* (U).

Friesland: Franeker, 16 VIII 1951, *Barkman* (L); Sexbierum, 25 VIII 1942, *Maas G. 2190* (L).

Drente: Paterswolde, 31 XII 1938, *Insje* (VS).

Overijsel: Zwolle, Herkulo, VIII 1940, *Stafleu*, c. ap. (U).

Gelderland: Elburg, VI 1940, *Stafleu* (U); Wezep, III 1940, *Stafleu* (U).

Utrecht: De Bilt, 19 I 1930, *Wassink 130* (Wask); Maarssen-Breukelen, 11 X 1943, *Maas G. 2807* (L): Veldhuizen-De Meern, 23 II 1941, 4 IV 1942, *Stafleu* (U).

Noord-Holland: Alkmaar, 16 V 1942, *Stafleu* (U); Alkmaar-Heiloo, 16 IX 1943, *Barkman 592* (L); Bloemendaal, 1926, *Mrs. De Visser—Roelofs*, c. ap. (L); Hoorn, 8 IX 1951, *Barkman 2821* (L); St. Maartensbrug, "Wildrijk", 29 IX 1943, *Barkman 594* (L); Wognum, 10 V 1945, *Maas G. 3200* (L).

Zuid-Holland: Leiden-Oud Ade, 21 VIII 1943, *Maas G. 2746* (L); Leiderdorp-De Kaag, VIII 1941, *Stafleu* (U); Wassenaar, Meiendel, 15 III 1942, *Van Rossem* (L).

Zeeland: Schouwen, Haamstede, 18 IX 1951, *Barkman 2829* (L), 20 IX 1951, *Barkman 2842*, c. ap. (L); Walcheren, Serooskerke, 1945, *Brakman* (L); Zuid-Beveland, Goes, 12 XI 1943, *Maas G. 2948* (L).

(Two more finds have been reported by *Barkman*, viz. from Tholen, Oud Vossemeer and Zuid-Beveland, Ellewoutsdijk; no specimens were collected).

Noord-Brabant: Lage Zwaluwe, 3 VII 1951, *Barkman* (L).

2. **Anaptychia fusca** (Huds.) Vain. in Termesz. Füzetek, vol. 22, 1899, p. 299; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 720 et vol. 10, 1940, p. 657 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 55 — *Lichen fuscus* Huds., Fl. Anglica, ed. 2, vol. 2, 1778, p. 533 (non vidi) — *Parmelia aquila* Ach., Lich. Un., 1810, p. 488; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 22.

Exsiccata: Claud. et Harm., Lich. Gall. exs., no 235; Desmazières, Pl. Cryptog. France, ed. II, no 250; Erb. Crittog. Ital., ser. I, no 467; Fl. Gall. Germ. exs., no 1396; Hepp, Flecht. Europ., no 602; Kryptog. exs. Vindob., no 2179, 2179b; Leighton, Lich. Brit. exs., no 144; Malbranche, Lich. Normand., no 172; Marcucci, Un. Itin. Cryptog. 1866, no 27; Massalongo, Lich. Ital. exs., no 87; Rabenhorst, Lich. Europ., no 586; Schaerer, Lich. Helv. exs., no 565; Schultz et Winter, Herb. Normale, no 98; Stenhammar, Lich. Suec. exs., no 43; Welwitsch, Cryptotheca Lusitana, no 70.

Iconography: Dietrich, Deutschl. Kryptog. Gew., vol. 4, 1846, tab. 51; Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 48, 56, fig. 287—289, 323—334; Smith et Sowerby, Engl. Bot., vol. 14, 1802, tab. 98.

Macroscopical description — Thallus foliose, growing in rosettes and stellate or irregularly wide-spreading with age, attached to the substratum by rhizinae, deeply incised. Lobes rigid and hard, somewhat discrete to contiguous or overlapping, elongate, 1 cm or more long, 0.4—1(—2) mm broad, richly and irregularly pinnately branched, plane or convex, towards the centre of the thallus completely covered with imbricate or entangled, 0.2—0.4 mm broad secondary lobules. Margins entire or somewhat sinuate, eciliate, not involute. Tips more or less broadened and fan-shaped, lobate or incised. Upper side of the lobes variously coloured, yellow-brown, chestnut, purplish brown, or almost black-brown, the parts exposed to the sun being always darker than those turned away, dull or somewhat shiny, naked, smooth or faintly lengthways striate, without *isidia* or *soredia*. Lower side of the lobes dirty white, yellowish or light brown at the circumference, black towards the centre, dull, longitudinally striate, sparingly rhizinose. Rhizinae thick, simple or furcate, brown-black. *Microscopical description* — Upper cortex colourless with a brown exterior zone and covered with a horny, necrotic layer, very densely plectenchymatous, with the hyphae more or less parallel to the surface, irregularly developed, with spurs into the medulla or even connected to the lower cortex by some strands of plectenchymatous tissue, 75—130 μ. Gonidia bright green, spherical, 6—10 μ, scattered throughout the medulla, densified into clusters or a continuous layer under the upper cortex, sometimes penetrating into both cortices. Medulla colourless, white in reflected light, rather thinly plectenchymatous, 0—75 μ, composed of mesodermatous hyphae. Lower cortex colourless, densely plectenchymatous, gradually passing into the medulla, 60—250 μ. *Apothecia* laminal or almost marginal, sessile or with constricted base, discoid, 1—1.5 mm in diam. Amphithecium concolorous with the thallus, dull, smooth or somewhat rugose. Margin persistent, broad, entire or crenate. Disc plane, black-brown, dull, smooth or rough, without pruina. Epithecium brown, granular, hypothecium colourless or yellowish, with a gonidial layer underneath. Hymenium colourless, 150—300 μ. Asci slender, clavate, 30—40 × 90—150 μ, 8-spored. *Spores* dark brown, 2-celled, constricted in the centre, ellipsoidal, straight or somewhat fabiform, thick-walled, with rounded or somewhat acute apices, 15—18 × 30—36 μ. Paraphyses hardly conglutinate, septate, simple or furcate upwards, with somewhat incrassate apices. *Pycnidia* common, located on the secondary lobes in the centre of the thallus, laminal, blackish, flush with the surface or protruding as small warts, spherical or pyriform, crateriform with age, 300—340 μ. Perifulcrium colourless, ostiolum brown to black. *Pycnoconidia* colourless, cylindrical, straight, 1—1.5 × 3—5 μ. *Chemical reactions* — Upper cortex N + red-brown, otherwise indifferent to the usual chemicals, as is the medulla.

Ecology and distribution in the Netherlands. In this country the species seems to have been strictly saxicolous and maritime. As nearly a century has elapsed since this rare species was found, it may be safely assumed that *A. fusca* is no longer a member of the native lichen flora.

Distribution in Europe. Considering the localities indicated on the labels of the exsiccata mentioned and of many more collections in our possession which have not been distributed as exsiccata, it appears that *A. fusca* is a maritime species occurring all along the coasts from Norway and Great Britain down to Italy in the Mediterranean. This distribution is largely in concordance with the data which may be compiled from the literature quoted on p. 280—284 and which show that *A. fusca* is lacking in the East European countries. It seems strange, therefore, that the species should also occur as far inland as the Swiss Alps. Lynge himself expressed his doubts as to the identity of those specimens with the Scandinavian material (l. c., p. 59). It is not impossible that the record of the inland occurrence of *A. fusca* in reality refers to var. *stippaea* (Ach.) Lynge, about the taxonomic position of which I would not venture to give my opinion. The different general appearance and geographical distribution, however, might point to another relation to *A. fusca* than on the level of a variety. Suffice it to state that Nádvorník (in Stud. Bot. Cechoslov., vol. 8, 1947, p. 75) considered *stippaea* a separate species.

Specimens examined.
Groningen: Uitwierde, 14 VIII 1856, *Acker Stratingh* (Gro).
Noord-Holland: Amsterdam, Zeeburg, *Van der Sande Lacoste*, c. ap. (NBV).

2. **PHYSCIA** (Schreb.) Th. Fr. em. Vain.

Th. Fr., Gen. Heterolich. Europ. Recogn., 1861, p. 59 (quoad nomen); Vain., Étude Lich. Brésil, pars 1, 1890, p. 138; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 577 et vol. 10, 1940, p. 650 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 60 — *Lichen Physcia* Schreb., Gen. Pl., vol. 2, 1791, p. 768 (pr. p.).

Thallus foliaceous, more or less orbicular, appressed to ascending, mostly attached to the substratum by rhizinae, deeply incised. Lobes dorsiventrally flattened, corticated, stratified, sometimes ciliate. Upper cortex densely plectenchymatous or paraplectenchymatous, always consisting of conglutinate hyphae perpendicular to the surface. Gonidia bright green (*Protococcus* Ag.), arranged in a layer under the upper cortex. Medulla plectenchymatous, consisting of leptodermatous or mesodermatous hyphae, white or rarely red. Lower cortex very densely plectenchymatous or paraplectenchymatous. *Apothecia* laminal, sessile or shortly pedicellate, discoid, lecanoroid, with orbicular, brown to black, naked or pruinose disc. Asci octosporous, though not all of the spores may reach maturity. *Spores* brown, 2-celled, ellipsoidal, with thickened cell-walls. In some extra-European species the spores are 4-celled or even muriform. Paraphyses mostly conglutinate, septate, simple or branched, more or less incrassate at their apices. Hypothecium colourless or dark-coloured, with gonidia underneath. *Pycnidia* immersed in the thallus, flush with the surface or protruding. Fulcra endobasidial, articulate. *Pycnoconidia* either short, cylindrical or ellipsoidal, and straight, or long, filiform and curved (description after Zahlbruckner in Engler-Prantl, Die natürl. Pflanzenfam., ed. 2, vol. 8, 1926, p. 257).

Subdivision. According to the classification in Zahlbruckner's Cat. Lich. Un., vol. 7, 1931, the genus *Physcia* includes the following groups: 1. *Hypomelaena* (Trevis.) Vain. (= sect. *Dirinaria* [Tuck.] Vain.); 2. *Euphyscia* Th. Fr.; 3. *Tetramelaena* (Trevis.) A. Zahlbr.; 4. *Hyperphyscia* (Müll. Arg.) A. Zahlbr. Of these, only *Euphyscia* occurs in Europe. The taxonomic rank of this group does not seem very well understood, and there is also some controversy as to its subdivision. Th. Fries in his Lich. Scand., vol. 1, 1871, p. 135 denotes *Euphyscia* with two asterisks, and in all probability herewith the subgenus was meant, as appears from the classification of the next genus *Xanthoria* which he divided into A. *Euxanthoria* and B. *Candelaria*. About these Fries says at page 145: "Plures auctores nostram *Xanthoriam* in duo sejungunt genera; duas sectiones admittere melius videtur". Obviously, the sections have been indicated by characters, the subgenera by asterisks.

Lynge (l. c., p. 61) describes the genus in a more restricted way than has been done by Zahlbruckner, so that his *Physcia* corresponds with the "Hauptgruppe" *Euphyscia*. Consequently he writes: "Obige Gattungsdiagnose entspricht dieser Gruppe", but this statement does not in the least explain the relation between the genus *Physcia* and his "group".

The less so as he again subdivides *Euphyscia* in *Brachysperma* and *Macrosperma* which are designated subgenera! At least, the latter has been so designated (p. 181); Lynge apparently forgot to describe the former. The "subgeneric" epitheta have been adopted from Vainio, but they differ in rank and partly also in conception. The former he divided into 7 sections, whereas the latter has only one species in Europe. When adopting Lynge's classification, it may be evident from the above explanation that the ranks necessarily have to be altered again.

Much on the same lines of Vainio's classification Räsänen subdivides the genus *Physcia*, only adding a third section, viz. *Parvulae* (in Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo, vol. 12, 1938/39, p. 94—102 and in Act. Bot. Fenn., vol. 33, 1943, p. 12). Since this system, however, has the same shortcoming in disregarding the importance of the types of the soralia and of the form and size of the pycnoconidia, I am inclined to keep to the views expressed by Lynge.

Subgenus EUPHYSCIA Th. Fr.,

Lich. Scand., vol. 1, 1871, p. 135 — *Physcia* sect. *Euphyscia* Th. Fr.; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 584 (ubi lit. et synon.).

Hypothecium colourless or pallid. *Spores* 2-celled.

Artificial key to the species.

- 1a. Lobes, at least at the periphery of the thallus, with marginal cilia 1) . . . 2
  - 2a. Thallus with soredia 3
    - 3a. Lobes with inflated, helmet-like tips, at the inside of which the soredia are produced . . . **6. Ph. adscendens** (Th. Fr.) Oliv. sensu Bitt.
    - 3b. Lobes with apical labriform soralia **7. Ph. tenella** (Scop.) DC. sensu Bitt.
  - 2b. Thallus esorediate, nearly always with apothecia **5. Ph. leptalea** (Ach.) DC.
- 1b. Lobes without marginal cilia 4
  - 4a. Thallus sorediate (or isidiate, the isidia eventually turning into soredia) . 5
    - 5a. Upper surface K + yellow 6
      - 6a. Medulla K + yellow 7
        - 7a. Soredia originate by the disintegration of the warty isidia which are scattered all over the surface; whole thallus sometimes turned into a soredial mass . . . . **4. Ph. clementi** (Sm.) Lynge
        - 7b. Soredia originate otherwise 8
          - 8a. Thallus with apical labriform soralia and a few laminal maculiform soralia . . . . . . **8. Ph. wainioi** Räs.
          - 8b. Thallus with laminal, globose soralia, never with labriform soralia . . . . . . **3. Ph. caesia** (Hoffm.) Hampe
      - 6b. Medulla K — 9
        - 9a. Lobes with apical labriform soralia 10
          - 10a. Soralia may extend towards the centre of the thallus, passing into marginal soralia, grey or white; lobes more appressed **9. Ph. dubia** (Hoffm.) Lettau

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1) Cilia should not be confused with rhizinae which, too, may project sideways. The former are as a rule longer and thicker and often tortuously curved, projecting freely into the air, and thus lending a tangled, disorderly and hairy appearance to the plant. Another expedient in distinguishing cilia and rhizinae is that ciliate species have few rhizinae or none at all. Yet, it cannot be denied that the discrimination is often badly hampered by incomplete development or by damage due to insects.

10b. Soralia may be broad and strongly curved upwards, but never merge into marginal soralia, greenish white; lobes more ascending . . . **7. Ph. tenella** (Scop.) DC. sensu Bitt.
9b. Lobes with crenate, partly sorediate margins; soredia sometimes confluent, forming marginal soralia. If apical soralia occur, in the centre of the thallus, they are never labriform **10. Ph. tribacia** (Ach.) Nyl.
5b. Upper surface K — 11
11a. Thallus very small, about 1 cm across, lobes extremely narrow, 0.1—0.5 mm broad, brown, loosely attached to ascending; soredia marginal, originating from minute marginal isidia which have disintegrated . . . . **13. Ph. nigricans** (Flk.) Stizenb.
11b. Not the above characters combined; in case of very small thalli, they are closely appressed to the substratum 12
12a. Thallus rigid, rather thick, loosely attached, large pieces may be easily lifted from the substratum with a knife 13
13a. Soralia maculiform, laminal or subterminal at the tips of sidelobes, never merging into a sorediate border along the margins of the lobes 1). Thallus epruinose **12. Ph. orbicularis** (Neck.) Pötsch
13b. Soralia mainly marginal, forming a sorediate border along the sides or sometimes also along the tips of the lobes 1). Lobes often pruinose, at least at the tips **15. Ph. grisea** (Lam.) A. Zahlbr.
12b. Thallus thin, closely appressed to the substratum and hardly to be removed with a knife without damage 14
14a. Lower cortex plectenchymatous, colourless, less than 20 μ thick **16. Ph. elaeina** (Sm.) A. L. Sm.
14b. Lower cortex paraplectenchymatous, dark-coloured, more than 20 μ thick . . . . **12. Ph. orbicularis** (Neck.) Pötsch
4b. Thallus esorediate 15
15a. Upper side K + yellow 16
16a. Medulla K + yellow; pseudocyphellae clearly visible, especially when thallus moistened . . . . **1. Ph. aipolia** (Ehrh.) Hampe
16b. Medulla K —; pseudocyphellae inconspicuous **2. Ph. stellaris** (L.) Nyl.
15b. Upper side K — 17
17a. Thallus rather thick, coarse, more or less loosely attached, pruinose in several forms. Upper and lower cortices densely plectenchymatous, with transitions to paraplectenchyma. Medulla usually more than 70 μ thick. Margin of apothecia without rhizinae **14. Ph. pulverulenta** (Schreb.) Hampe
17b. Thallus thin, closely attached to the substratum, never pruinose. Upper and lower cortices paraplectenchymatous. Medulla usually less than 70 μ thick. Margin of apothecia often with rhizinae **11. Ph. ciliata** (Hoffm.) DR.

Key to the sections.

1a. Pycnoconidia short, straight . . . sect. 1. BRACHYSPERMA (Vain.) em. Maas G.
1b. Pycnoconidia long, filiform, curved . . sect. 2. MACROSPERMA (Vain.) Maas G.

Sectio 1. BRACHYSPERMA (Vain.) em. Maas G. nov. comb.

— *Physcia* sect. 1. *Euphyscia* b. *Sordulenta* 1. *Brachysperma* Vain., Étude Lich. Brésil, pars 1, 1890, p. 144 (quoad nomen) — *Physcia* subgen. *Brachysperma* (Vain.) em. Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 62.

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1) To be examined at the circumference of the thallus, since the centre may be completely turned into a sorediose mass.

Pycnoconidia short, cylindrical or ellipsoidal, straight.

Remarks. It is obvious that *Brachysperma* taken in this sense has a much broader delimitation than originally conceived by Vainio.

Key to the subsections.

(After Lynge, l. c., p. 62)

1a. Upper side K + yellow 2
  2a. Lobes ascending or at least more or less free from the substratum, supplied with mostly long marginal cilia . . subsect. 4. Tenella (Lynge) Maas G.
  2b. Lobes more or less closely appressed, rarely ascending, without marginal cilia 3
    3a. Thallus without soralia or isidia subsect. 1. Stellaris (Lynge) Maas G.
    3b. Thallus sorediate or isidiate 4
      4a. Thallus exclusively sorediate 5
        5a. Soralia laminal, maculiform, globose subsect. 2. Caesia (Lynge) Maas G.
        5b. Soralia apical and labriform, or marginal; laminal ones may also occur . . . subsect. 5. Tribacia (Lynge) Maas G.
      4b. Thallus covered with isidia which eventually may disintegrate, turning into soralia . . subsect. 3. Astroidea (Lynge) Maas G.
1b. Upper side K — 6
  6a. Thallus dark grey to brown-black, epruinose, 1—4(—5) cm across. Apothecia small, 1—1.5(—2) mm in diam., with small spores, rarely reaching 25 μ in length subsect. 6. Obscura (Lynge) Maas G.
  6b. Thallus greyish white to brown, usually pruinose, 5—10(—12) cm across. Apothecia large, 2—4(—5) mm in diam., with spores longer than 25 μ subsect. 7. Pulverulenta (Lynge) Maas G.

Subsectio 1. Stellaris (Lynge) Maas G. nov. comb.

— *Physcia* subgen. *Brachysperma* sect. *Stellaris* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 65; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 650.

Thallus medium to large, 2—10 cm in diam., appressed, white, grey, blue-grey or ash-grey, without *soralia* or *isidia*, eciliate. Upper cortex K + yellow.

Key to the species.

1a. Medulla K + yellow. Pseudocyphellae clearly visible, especially after the thallus has been moistened . . . . 1. **Ph. aipolia** (Ehrh.) Hampe
1b. Medulla K —. Pseudocyphellae inconspicuous . . . 2. **Ph. stellaris** (L.) Nyl.

1. **Physcia aipolia** (Ehrh.) Hampe in Fürnr., Naturh. Topogr. Regensburg, vol. 2, 1839, p. 249; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 590; vol. 8, 1932, p. 596 et vol. 10, 1940, p. 650 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 66 — *Lichen aipolius* Ehrh. in Humb., Fl. Friburg. Spec., 1793, p. 19 — *Parmelia stellaris* var. *aipolia* Fr., Sched. Crit., vol. 7, 1826, p. 4 (non vidi); Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129; Abelev. in Prodr. Fl. Batav., ed. 2, vol 2, pars 2, 1898, p. 20.

Exsiccata: Claud. et Harm., Lich. Gall. exs., no 127; Desmazières, Pl. Cryptog. Nord France, no 145; Elenkin, Lich. Fl. Ross., no 88; Erb. Crittog. Ital., no 115; Floerke, Deutsche Lich., no 135; Fl. Hungarica exs., no 220; Funck, Cryptog. Gew. Fichtelgeb., no 475; Hepp, Flecht. Europ. no 877; Kryptog. exs. Vindob., no 2078; Leighton, Lich. Brit. exs., no 6; Malbranche, Lich. Normand., no 25; Massalongo, Lich. Ital. exs., no 318A; Nádvorník, *Physciac.* exs., II, no 11; Rabenhorst, Lich. Europ., no 185 (pro min. parte); Räsänen, Lichenotheca Fenn., II, no 40; Schaerer, Lich. Helv. exs., no 350; Schrader, Samml. Cryptog. Gew., no 149; Stenhammar, Lich. Suec. exs., no 73 inf.

Iconography: Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tab. 29, fig. 9; Cretzoiu in Inst. Cercetar. Experim. Forest., ser. 2, vol. 47, 1941, tab. 18, fig. 1; Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 19—20, fig. 113—125; Magnusson, Fl. Skand. Busk-och Bladlav., 1929, tab. 2, fig. 15; Migula, Kryptog.-Fl. Deutschl., vol. 4, pars 1, 1929, tab. 3, fig. 1—3; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 13, fig. 2.

Macroscopical description — Thallus foliaceous, growing in rosettes, more or less stellate, rather large, 6—10 cm in diam., attached to the substratum by rhizinae, deeply incised. Lobes pretty rigid, thick, as a rule long and narrow, 2—4 cm long, 1—1.5 mm broad, appressed, contiguous and sometimes even with plicate, ascending margins when tightly pressed against each other, or overlapping or more or less widely discrete (very rare in the indigenous material), richly and irregularly pinnatifid, plane or somewhat corrugated at the circumference, more or less convex towards the centre. Margins entire. Tips broadened and fan-shaped, incised. Upper surface grey-white to ash-grey, dull, smooth or irregularly indented or becoming wrinkled with age and often with secondary laciniae in the centre of the thallus, without *isidia* or *soredia* and epruinose, densely spotted with more or less conspicuous, whitish, irregular dots (pseudocyphellae). Lower surface dirty white to brown, dull, densely covered with pallid or dark brown rhizinae. *Microscopical description* — Upper cortex colourless with a broad yellow-brown exterior zone, paraplectenchymatous, 45—75 μ, frequently ruptured and alternating with spurs of medullary tissue and gonidia (pseudocyphellae). Gonidia bright green, spherical or broadly ellipsoidal, 7—12(—16) μ, arranged in clusters or in an uninterrupted layer of 15—60(—100) μ, closely under the upper cortex or, in the pseudocyphellae, reaching the surface. Medulla colourless, white in reflected light, densely plectenchymatous, consisting of mesodermatous hyphae, 45—120 μ. Lower cortex colourless except for a narrow brownish exterior zone, very densely plectenchymatous, with an occasional indication of paraplectenchyma in the outer zone, 30—75 μ. *Apothecia* nearly always extant, numerous, frequently completely covering the centre of the thallus, laminal or marginal, sessile, deeply cup-shaped to discoid, up to 2 mm in diam. Amphitecium concolorous with the thallus or lighter, dull, smooth or faintly indented. Margin persistent, entire when young, later on crenulate. Disc plane or corrugated with age, chestnut to almost black, usually covered with a thick bluish grey pruina. Epithecium brown-yellow, hypothecium colourless, with a layer of gonidia underneath. Hymenium colourless, 90—120 μ. Asci clavate to cylindrical, 12—24 × 60—85 μ, 8-spored. *Spores* dark brown, 2-celled, not constricted in the centre, ellipsoidal, straight or somewhat fabiform, with strongly thickened cell-walls at the septum and the rounded apices, 9—11 × 19—23(—27) μ. Paraphyses unbranched, septate, slightly clavate at the apices, conglutinate. *Pycnidia* common, located at the tips of the lobes, especially of those in the centre of the thallus, laminal, visible as black dots or warts, spherical or pyriform, 180—200 μ in diam. Perifulcrium colourless or brownish. Ostiolum black. *Pycnoconidia* colourless, cylindrical, straight, ± 1 × 4—5 μ. *Chemical constituents* and *reactions* — Upper cortex as well as medulla K + intensively yellow; other chemicals such as C and Pd do not evoke any reaction. According to Zopf (Flechtenstoffe, 1907, p. 226 and 416), the species contains atranorin ($C_{19}H_{18}O_8$).

Ecology and distribution in the Netherlands. Although *Ph. aipolia* has been found on a wooden fence and on a boulder, the species may generally speaking be considered corticolous. It has been found on a variety of trees, such as *Aesculus, Alnus, Betula* (!), *Fagus* (!), *Fraxinus, Juglans, Populus, Quercus, Salix, Sambucus, Tilia* and *Ulmus.* Finds on the bark of *Populus* and *Salix* are not rare, but there is no doubt that *Ulmus* is by far the most favoured tree. *Ph. aipolia* is said to be a nitrophilous species, and I certainly found it in company of such nitrophilous lichens as *Xanthoria parietina, Ph. adscendens, tenella* and *orbicularis.* Yet, it is rarely if ever found at the very base of the trees which is supposed to be richest in nitrogen compounds. Furthermore, it is my impression that the species decidedly avoids too near proximity of farmyards which as a rule are favourable places for collecting the above mentioned lichens.

Judging from the herbarium material, *Physcia aipolia* must have been quite common in this country up to the beginning of this century, and growing in large thalli. Recent finds, however, are getting rare, whereas the thalli never exceed 8 cm in diam. Since *Ulmus* is favourite as a host and is most extensively used for a wayside-tree in the northern and western provinces of the country, *Ph. aipolia* is common in Groningen, Friesland, Noord- and Zuid-Holland and Zeeland, and to a somewhat lesser extent in the western portions of the provinces Utrecht, Gelderland and Noord-Brabant. Whereas in former times the species has only been collected from few localities in the other provinces, recent finds are lacking altogether. It is not known whether this is merely due to the scarcity or even lack of elms in those regions.

Distribution in Europe. Judging from the records mentioned in the literature cited on p. 280—284, *Ph. aipolia* is a wide-spread species in Europe.

Remarks. Though it has become generally accepted to attribute to Ehrhart the first use of the specific epithet, it should be borne in mind that the identity of Ehrhart's *Lichen aipolius* does not seem to be established, cf. Lynge, l. c., p. 67. Neither the original diagnosis nor the "observatio", which were copied and sent to me by the "Westdeutsche Bibliothek" at Marburg/Lahn, carry us any further. It should be pointed out, however, that contrary to Lynge's findings with the Viennese specimen of *Lichen aipolius* in Ehrhart's Pl. cryptog., no 197, the specimen sent to me from Geneva is true *Ph. aipolia*: conspicuous pseudocyphellae, medulla staining yellow when touched with K, large spores measuring 8.5—12 × 19—26 μ.

Concerning the difference of *Ph. aipolia* from *stellaris* and *pulverulenta*, I may refer to those species.

Variability. Among the varieties described in *Ph. aipolia*, var. *acrita* (Ach.) Hue had puzzled me for a long time. Now that I have seen the species and its varieties in Lynge's herbarium, I have come to the conclusion that var. *acrita* is nothing else but f. *typica* or, more correctly, f. *aipolia*. Already the remarks made by Acharius in his Lichenographia universalis, 1810, give a clue in this direction. Of *Ph. aipolia* he stated: "Thallus junior et adultus valde differens unde sub utroque statu considerandus ac describendus..." (p. 477), and continuing with var. *acrita*: "Est haec quae ... per aetatem in varietatem *cercidiam* et *anthelinam* abit" (p. 478). It follows that Acharius considered *acrita* a juvenile stage of *aipolia* which with age would develop into *cercidia*, a statement which is certainly correct. *Cercidia* only differs from f. *aipolia* in having crenulate apothecial margins, and I agree with Lynge that a separate name is superfluous.

It is different in the case of *anthelina* which I prefer to rank as forma rather than variety. Most certainly it is not an older stage of f. *aipolia*, as supposed by Acharius, since already in very young specimens the lobes are widely discrete with a more or less conspicuous felt of black rhizines in between. True *anthelina* has never been found in Holland, having a more boreal-alpine distribution, but transitional stages do occur in our older collections.

A characteristic feature in older specimens is the warted or wrinkled centre of the thallus. Such specimens have been called f. *verruculosa* Vain. (apud Räs. in Medd. Soc. F. Fl. Fenn., vol. 46, (1920) 1921, p. 166), but again, there is no need of designating them by a separate name.

As a rule, the apothecia in *aipolia* are caesio-pruinose, though specimens showing completely naked apothecial discs are not uncommon. Wishing to express the difference, Sántha in his monograph (in Fol. Cryptog., vol. 1, 1928) designated the modifications by calling them f. *caesiopruinosa* Arn. (p. 475) and f. *melanophthalma* (Mass.) Arn. (p. 474). As to the former, it might be disputed whether Arnold (in Flora, vol. 67, 1884, p. 168) really intended *caesiopruinosa* to be used as a subdivisional epithet. With regard to *melanophthalma*, it should for accuracy's sake be pointed out that the first author to transfer the form to *Ph. aipolia* was Sántha himself, not Arnold. It should be borne in mind, however, that it is rather useless to try to discriminate between either "forms", since it is not rare for *Ph. aipolia* to have pruinose and epruinose apothecia in the same specimen, see e. g. Galløe, l. c., tab. 19, fig. 113 and 117.

Another form described as new by Sántha (l. c., p. 478) is var. *angulosa* which is characterised in that the apothecia are so densely crowded as to loose their originally circular shape, becoming angular. It is an insignificant modification which hardly deserves mentioning.

2. Physcia stellaris (L.) Nyl. in Act. Soc. Linn. Bordeaux, vol. 21. 1856, p. 307 (quoad nomen); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 681 et vol. 10, 1940, p. 655 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 75 — *Lichen stellaris* L., Spec. Pl., vol. 2, 1753, p. 1144 — *Parmelia stellaris* var. *ambigua*

Schaer., Lich. Helv. Spicileg., sect. 9, 1840, p. 439; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 20.

Macroscopical description — Thallus foliaceous, growing in rosettes, more or less stellate, small to medium-sized, 2—4 cm in diam., attached to the substratum by rhizinae, deeply incised. Lobes pretty rigid, 1—1.5 cm long and 0.2—1.5 mm broad, loosely attached, discrete or closely contiguous or overlapping near the tips, richly and irregularly pinnately branched, plane or somewhat corrugated at the circumference of the thallus, convex in the centre. Margins entire. Tips as broad as the lobes or even somewhat attenuate, in other cases broadened and fan-shaped, emarginate or incised. Upper side grey-white to ash-grey, dull, smooth or somewhat indented, in the centre becoming wrinkled or warty with age or sometimes distinctly papillate, without *isidia* or *soredia*, epruinose, with inconspicuous, minute, whitish dots (pseudocyphellae). Under surface dirty white, dull, with pallid rhizinae whose tips are brownish and frequently project sideways. *Microscopical description* — Upper cortex colourless but for a broad brownish exterior zone, indistinctly paraplectenchymatous with transitions to palisade plectenchyma, 25—60 μ, with numerous breaks through which the gonidia reach the surface (pseudocyphellae). Gonidia bright green, spherical, 8—14 μ, arranged in clusters or in an uninterrupted layer of 20—40 μ, closely under the upper cortex or the surface. Medulla colourless, white in reflected light, fairly densely plectenchymatous, about 60 μ thick, consisting of mesodermatous hyphae. Lower cortex colourless or with a narrow brownish zone, very densely plectenchymatous, with the hyphae more or less parallel to the surface, rather gradually passing into the medulla, 45—60 μ. *Apothecia* nearly always extant and sometimes numerous, laminal, sessile or shortly pedicellate, cup-shaped to discoid, generally 2 or 3 mm in diam., sometimes up to 4—4.5 mm. Amphithecium concolorous with the thallus, dull, smooth. Margin persistent, entire, later on crenulate. Disc plane or becoming corrugated in older specimens, brown to dark fuscous or almost black, naked or caesio-pruinose. Epithecium yellow-brown, hypothecium yellowish, with a layer of gonidia underneath. Hymenium colourless, 80—90 μ. Asci cylindrical, 10—20 × 58—75 μ, octosporous. *Spores* brown, 2-celled, ellipsoidal, straight or somewhat curved, not constricted at the septum or only slightly so, with strongly thickened cell-walls at the septum and the rounded apices, 7—9 × 18—24 μ. Paraphyses simple or branched, septate, conglutinate, clavato-incrassate at the apices. *Pycnidia* common, scattered over the upper side of the lobes, laminal, submerged in the thallus or somewhat protruding and warty, spherical or pyriform, 100—180 × 200—250 μ. Perifulcrium colourless or brownish yellow. Ostiolum brown-black. *Pycnoconidia* colourless, cylindrical, straight, 0.8 × 4.5—5.5 μ. *Chemical constituents* and *reactions* — Upper cortex K + yellow, Pd + slowly light lemon-yellow, C —. Medulla K —, C —, Pd —. The positive reaction of the upper cortex upon K may possibly be attributed to the presence of atranorin ($C_{19}H_{18}O_8$).

Ecology and distribution in the Netherlands. In this country the species has been found on *Alnus*, *Betula* (!), *Fraxinus*, *Larix* (!), *Populus*, *Ulmus* and fruit trees. *Ph. stellaris* seems to be less nitrophilous than *Ph. aipolia*; it also is and has most probably always been much rarer.

Distribution in Europe. *Ph. stellaris*, as its nearest relative *Ph. aipolia*, is a wide-spread lichen in Europe, though various comments show that it is far less common.

Remarks. The first to make the combination *Ph. stellaris* was Nylander, to be sure, but as appears from his description, he also included such varieties as *tenella* and *leptalea* which we now consider separate species. The first modern delimitation originates from Harmand (in Bull. Soc. Sci. Nancy, ser. 2, vol. 31, (1896) 1897, p. 258), which made Lynge write *Ph. stellaris* (L.) Nyl. em. Harm.

Physcia stellaris differs from *Ph. aipolia* in that its pseudocyphellae are far less visible, in its lobes maintaining approximately the same width at their apices or, if fanning out, not getting so broad, and in its medulla which remains unaltered when treated with K. For the discussion of the difference between *stellaris* and *leptalea*, I may refer to the remarks under the latter.

Variability. As far as this country is concerned, the variability of *Ph. stellaris* trends into 2 main directions. Firstly, the lobes may be narrow and very distinctly discrete, much more so than in f. *stellaris* (f. *radiata*); secondly, the lobes may be broader and more contiguous than in f. *stellaris*, with considerably broadened tips (f. *rosulata*). Intermediate stages are common.

Nádvorník (in Stud. Bot. Cechoslov., vol. 8, 1947, p. 81), mentioning Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tab. 29, fig. 7 for a picture, described a new f. *subradiata* which is intermediate between f. *stellaris* and f. *radiata*. One may well wonder at the use of distinguishing such forms.

If f. *rosulata* should represent a stage modified by age, as was already supposed by Acharius and subsequently by Lynge, this is certainly not so in the case of f. *radiata*. Fact is, however, that it is common, though by no means the rule, for f. *rosulata* to have the centre of the thallus wrinkled or warty which is generally held as a sign of advanced age. In some cases the thallus is not only warty, but distinctly papillate as well. It is to such stages that the following epithets refer: f. *granulata* Bouly de Lesd. (in Bull. Soc. Bot. France, vol. 59, 1912, p. 207), var. *pergranulata* Mereschk. (in Ann. Cons. Jard. Bot. Genève, vol. 21, 1919, p. 193; I have seen this collection) and var. *papillosa* Hillm. (in Verh. Bot. Ver. Prov. Brandenburg, vol. 65, 1923, p. 74). Most probably they are identical. It is hard to say, however, going by the descriptions only, whether they are also synonymous with var. *tuberculata* (Kernst.) DT. et Sarnth. which was originally described by Kernstock (as *Parmelia stellaris* f. *tuberculata* in Verh. zool. bot. Ges. Wien, vol. 46, 1896, p. 295) as being covered with "tuberculis carneo-albicantibus".

f. *ambigua* Rabenh. which figured in several older floras has disappeared in modern works, the obvious reason being that its basinym, *Lichen ambiguus* Ehrh. (1785), though antedating *Lichen ambiguus* Wulf. (1790) by 5 years, was not validly published. When issuing his *Lichen ambiguus* as Cryptog. exs., no 207, Ehrhart omitted to add a diagnosis.

I have seen the specimen from the Geneva herbarium and found it to agree with *Ph. stellaris* f. *stellaris.*

Ph. stellaris f. *subtenella* described by Anders in Hedwigia, vol. 63, 1922, p. 319 ought to be withdrawn. I have seen the authentic material kindly sent on loan from the Prague Museum by Dr A. Pilát, and it appears that the subdivisional epithet had been based on two different species, viz. *Ph. stellaris,* on one side partly overgrown by *Ph. adscendens.*

f. **stellaris.**

Exsiccata: Arnold, Lich. exs., no 788b—d; Arnold, Lich. Monac. exs., no 462, 466; Claud. et Harm., Lich. Gall. exs., no 179; Elenkin, Lich. Fl. Ross., no 87a; Fl. exs. Austro-Hung., no 2732 I—II; Funck, Kryptog. Gew. Fichtelgeb., no 475; Hepp, Flecht. Europ., no 878; Kryptog. exs. Vindob., no 1260; Rabenhorst, Lich. Europ., no 185 (pro max. parte); Räsänen, Lichenotheca Fenn., II no 39; Reichenb. et Schub., Lich. exs., no 86; Schaerer, Lich. Helv. exs., no 351; Stenhammar, Lich. Suec. exs., no 73 sup.

Iconography: Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tab. 29, fig. 7 (ad f. *radiatam* vergens); Cretzoiu in Inst. Cercetar. Experim. Forest., ser. 2, vol. 47, 1941, tab. 20, fig. 2; Fink in Contrib. United States Nation. Herb., vol. 14, pars 1, 1910, tab. 47, fig. B et Lich. Fl. United States, 1935, tab. 47, fig. A; Harmand, Lich. France, vol. 4, 1909, tab. 15, fig. 4; Lynge in Bergens Mus. Aarb., 1910, no 9, tab. 4, fig. 6; Magnusson, Fl. Skand. Busk- och Bladlav., 1929, tab. 2, fig. 12 (indistinct); Migula, Kryptog.-Fl. Deutschl., vol. 4, pars 1, 1929, tab. 2, fig. 2 (indistinct); Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 13, fig. 1.

Description — Lobes 0.5—1 mm broad, equally broad or somewhat broadening at the tips, either somewhat discrete or contiguous or overlapping.

Specimens examined.

Groningen: Groningen, III 1839, *Van Hall* (NBV); Haren, 12 VI 1845, c. ap. (NBV).

Drente: Beilen, 25 V 1943, *Wasscher,* transition to f. *rosulata* (Wasr).

Overijsel: Kampen, *Top* (L).

Gelderland: Groesbeek, 16 VIII 1869, *Van Hall,* c. ap. (NBV); Renkum-Heelsum, 1840, *Buse & Gildemeester-Buse,* c. ap. (NBV).

Utrecht: Driebergen, 4 IX 1868, *Oudemans,* c. ap. (U).

Noord-Holland: Nieuwer Amstel, Meerhuizen, I 1849, *Van der Sande Lacoste,* c. ap. (L).

Zuid-Holland: Leiden-'s-Gravenhage, *Perein,* c. ap. (NBV).

Zeeland: Walcheren, Arnemuiden, Sloedam, 1 V 1941, *Brakman,* c. ap., transition to f. *rosulata* (L); Walcheren, Veere, 24 IX 1951, *Barkman 2855* (L).

Noord-Brabant: Coudewater, 3 VII 1904, *Wakker,* c. ap. (L).

Limburg: Maastricht, *Franquinet,* c. ap. (Maastr.).

f. **radiata** (Ach.) Nyl. in Notis. Sällsk. F. Fl. Fenn. Förh., vol. 5, 1861, p. 111 — *Parmelia stellaris* var. *radiata* Ach., Lich. Un., 1810, p. 477 — *Physcia stellaris* var. *radiata*; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 689 et vol. 10, 1940, p. 655 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 79.

Iconography: Lynge in Vidensk. Selsk. Skrift., Mat.-Naturvid. Kl., vol. 1, 1916, tab. 3, fig. 5; Smith et Sowerby, Engl. Bot., vol. 24, 1807, tab. 1697 (uncertain).

Description — Lobes narrow, 0.2—0.5 mm broad, discrete and equally broad from centre to periphery, stellate. *Apothecia* with pruinose disc and entire margin.

Specimens examined.

Drente: Wijster, 20 V 1943, *Wasscher* (Wasr).

Noord-Holland: Nieuwer Amstel, Meerhuizen, I 1849, *Van der Sande Lacoste*, c. ap., not typical (NBV).

f. **rosulata** (Ach.) Nyl. in Notis. Sällsk. F. Fl. Fenn. Förh., vol. 5, 1861, p. 111 — *Parmelia stellaris* var. *rosulata* Ach., Lich. Un., 1810, p. 477 — *Physcia stellaris* var. *rosulata*; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 690 et vol. 10, 1940, p. 655 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 80.

Iconography: Lynge in Vidensk. Selsk. Skrift., Mat.-Naturvid. Kl., vol. 1, 1916, tab. 3, fig. 4 et in Rabenh., l. c., tab. 5, fig. 3.

Description — Lobes 1—1.5 mm broad, closely contiguous, broadened and fan-shaped at the tips and here frequently overlapping, becoming wrinkled and warty in the centre of the thallus. *Apothecia* with slightly pruinose or epruinose disc and entire to crenate margin.

Specimens examined.

Overijsel: Kampen, *Top*, c. ap. (L); Zwolle, XI 1908, *Lako*, c. ap. (L).

Gelderland: Renkum-Heelsum, 1840, *Buse & Gildemeester-Buse*, c. ap. (NBV).

Zeeland: Walcheren, Nieuw en St. Joosland, 23 VII 1946, *Brakman* (L).

Limburg: Maastricht, *Franquinet*, c. ap. (L).

Subsectio 2. Caesia (Lynge) Maas G. nov. comb.

— *Physcia* subgen. *Brachysperma* sect. *Caesia* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 86; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 650.

Thallus small to medium, 2—3(—5) cm in diam., closely appressed, light grey, lead-grey to bluish grey, without *isidia* or marginal cilia, but with laminal, whitish or blue-grey, maculiform *soralia*. Upper cortex K + yellow.

3. **Physcia caesia** (Hoffm.) Hampe in Fürnr., Naturh. Topogr. Regensburg, vol. 2, 1839, p. 250; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 600 et vol. 10, 1940, p. 651 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 86 — *Lichen caesius* Hoffm., Enum. Lich., 1788, p. 65 (non vidi) — *Parmelia caesia* Ach., Meth. Lich., 1803, p. 197; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 130; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 21.

Exsiccata: Arnold, Lich. Monac. exs., no 87, 88; Claud. et Harm, Lich. Gall. exs., no 74 (pro parte *Ph. dubia*); Cretzoiu, Lich. Roman. exs., no 40; Elenkin, Lich. Fl. Ross., no 117a, 117b; Floerke, Deutsche Lich., no 71; Malbranche, Lich. Normand., no 273; Rabenhorst, Lich. Europ., no 930; Räsänen, Lichenotheca Fenn., II no 42; Schaerer, Lich. Helv. exs., no 347 (pro parte); Stenhammar, Lich. Suec. exs., no 212.

Iconography: Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tab. 30, fig. 4; Dietrich, Deutschl. Kryptog. Gew., vol. 4, 1846, tab. 46 (discoloured); Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 21—23, fig. 126—145; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 6, fig. 2; Migula, Kryptog.-Fl. Deutschl., vol. 4, pars 1, 1929, tab. 2, fig. 1; Rieber, Zur Flechtenfl. Ehingen, 1901, fig. infima sinistr.; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 14, fig. 6; Smith et Sowerby, Engl. Bot., vol. 15, 1802, tab. 1052; A. Zahlbr. in Engler-Prantl, Die natürl. Pflanzenfam., ed. 2, vol. 8, 1926, fig. 126A.

Macroscopical description — Thallus foliaceous, growing in rosettes, stellate but becoming more irregular with age or in specimens fused together, medium-sized, averaging 2—4 cm in diam., closely attached to the substratum by rhizinae, deeply incised. Lobes rigid, long and narrow, 1—1.5 cm long and 0.5—1 mm broad, closely appressed, somewhat discrete to contiguous or overlapping, irregularly and richly pinnately branched, plane or concave or corrugated at the tips, becoming more or less strongly convex towards the centre, sometimes with small secondary laciniae which may cover the centre. Margins entire. Tips as broad as the remainder of the lobes or broadened an fan-shaped, rounded to crenate or incised. Upper surface white-grey, bluish grey to ash-grey, often darker towards the centre, dull, epruinose or slightly pruinose at the tips of the lobes, smooth but getting wrinkled or warty with age, either with or without inconspicuous whitish dots — no pseudocyphellae, properly speaking, since the upper cortex is not ruptured; the dots are due to the gonidial clusters being situated at various heights —, without *isidia* but with maculiform *soralia*. *Soralia* laminal, scattered over the upper side of the lobes but also close to the tips and therefore, when growing out, seemingly apical, globose, 0.8—2 mm in diam., coarsely grained, at first dark grey or bluish grey, later on more white. Lower surface of the lobes white or dirty white to brownish, dull, smooth, plane or somewhat concave, with simple or furcate, short dark rhizinae. *Microscopical description* — Upper cortex colourless except for a broad brownish outer zone, paraplectenchymatous, 35—65 μ. Gonidia bright green, spherical or broadly ellipsoidal, 7—12 μ, arranged in a continuous stratum or in clusters of 30—50(—60) μ, closely under the cortex or penetrating into it. Medulla colourless, white in reflected light, fairly densely plectenchymatous, 30—140 μ, composed of leptodermatous hyphae. Lower cortex colourless or with a narrow brownish exterior zone, very densely plectenchymatous, though sometimes tending to form a paraplectenchyma, 30—60 μ, gradually passing into the medullary stratum. *Apothecia* rare and, if extant, in small numbers only, laminal, sessile, cup-shaped to discoid, 0.8—1.5 mm in diam. Amphithecium of the same colour as the thallus, dull, smooth. Margin persistent, entire or slightly crenate. Disc plane, brown-black, dull, epruinose or covered with a light bluish pruina. Epithecium brown, hypothecium colourless to yellowish, with clusters of gonidia underneath. Hymenium colourless, 60—75(—90) μ. Asci cylindrical to clavate, 15—17 × 45—65 μ, 8-spored. *Spores* olive-brown, 2-celled, more or less constricted, ellipsoidal, straight or somewhat curved, with strongly thickened cell-walls at the septum and at the rounded apices, 8—9.5 × 15—18 μ. Paraphyses simple or furcate, septate, conglutinate, capitato-incrassate at the apices. *Pycnidia* rather rare, laminal, scattered over the lobes, single or in small groups of 2—3, visible as black dots, spherical, pyriform or irregularly shaped, 70—120 × 135—150 μ.

Perifulcrium colourless or yellowish brown, ostiolum black-brown. *Pycnoconidia* colourless, cylindrical, straight, ± 1 × 4—5 μ. *Chemical constituents* and *reactions* — Upper cortex K + yellow, Pd + slowly yellow; medulla K + yellow, Pd —. According to Zopf (Flechtenstoffe, 1907, p. 226, 415), *Ph. caesia* contains atranorin ($C_{19}H_{18}O_8$) and zeorin ($C_{30}H_{52}O_2$).

Ecology and distribution in the Netherlands. *Physcia caesia* in this country is predominantly a saxicolous species, but it is also very common on trees and occurs, more rarely, on lignum. It has been found on sandstone, granite, concrete, bricks, slates, roofing tiles and the like, whereas not infrequently it grows over adjoining mosses. Among the trees, of which *Betula*, *Fraxinus*, *Populus*, *Salix* and *Ulmus* may be enumerated, the latter is undoubtedly most favoured as a host. *Ph. caesia* certainly is extremely nitrophilous — both koniophilous and ornithokoprophilous — for it is one of the few species which really thrive on brick walls near human dwellings, on roofs of farm-yard sheds, or on the bark of dust-encrusted trees along country-roads. It is a common species throughout the country.

Distribution in Europe. The species abounds throughout Europe.

Remarks. On account of its notable globose soralia, *Ph. caesia* is not liable to be mistaken for any other grey *Physcia*, not even for *Ph. dubia* which, on bricks or tiles, strikingly often occurs in its company and even grows partly mixed with it. At times, however, *Ph. orbicularis*, belonging to the subsection *Obscura* and also possessing spherical soralia, may be so light-grey as to allow confusion. Very light-coloured thalli of *orbicularis*, however, turn distinctly green when moistened, whereas *caesia* changes only little in colour. Moreover, the underside of *orbicularis* is black, and the abraded soralia have a greenish hue. In *caesia*, on the contrary, the lower side is dingy white to brownish, and the abraded soralia are white. Finally, upper cortex and medulla of *orbicularis* never react upon K.

Variability. The arboreal occurrence of *Ph. caesia* seems to have attracted the attention to such an extent that the corticolous form was twice described: first as *Ph. caesia* var. *corticola* by Kullhem (in Notis. Sällsk. F. Fl. Fenn. Förh., vol. 11, 1871, p. 272), secondly as *Ph. caesia* f. *corticola* by Eitner (in 88 Jahresber. Schles. Ges. vaterl. Kult., (1910) 1911, p. 22). According to Art. 30 of the Rules of Botanical Nomenclature, the last-mentioned subdivisional epithet is illegitimate anyway. Though I have not seen the original specimens, it may be safely assumed that between them there will be no more appreciable difference, than between Kullhem's var. *corticola* and *Ph. caesia* itself.

Eitner (l. c., p. 22) also described a f. *pruinosa* which should be characterised in having densely caesio-pruinose apothecia, but here again I consider the difference negligible, since sometimes specimens may be found of which the older apothecia are epruinose, but the youngest show traces of a bluish pruina, thus forming a transition to the modification with permanently pruinose apothecial discs.

In Hedwigia, vol. 63, 1922, p. 320, Anders described f. *dendritica* and f. *panniformis*, neither of which in reality belong to the present species. The former was correctly recognised as belonging to *Ph. wainioi* (= *caesiella*) by both Schade (note on the label) and Nádvorník (in Stud. Bot. Cechoslov., vol. 8, 1947, p. 87), whereas Schade may be right in identifying f. *panniformis* also as *Ph. wainioi.* The material from herb. Anders which I have seen is rather poor.

Subsectio 3. Astroidea (Lynge) Maas G. nov. comb.

— *Physcia* subgen. *Brachysperma* sect. *Astroidea* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 92; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 650.

Thallus small to medium, 1—5 cm in diam., appressed to the substratum, white-grey, without marginal cilia, with warty *isidia* which may disintegrate and turn *servediose.* Upper cortex K + yellow.

4. Physcia clementi (Sm.) Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1. 1935, p. 93 — *Lichen Clementi* Sm. in Smith et Sowerby, Engl. Bot., vol. 25, 1807, tab. 1779 — *Parmelia Clementiana* Ach., Lich. Un., 1810, p. 483; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129 — *Parmelia astroidea* var. *Clementiana*; Rabenh., Deutschl. Kryptog.-Fl., vol. 2, 1845, p. 63; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 21 — *Physcia Clementiana* Kickx, Fl. Cryptog. Flandres, vol. 1, 1867, p. 226; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 607 et vol. 10, 1940, p. 651 (ubi lit. et synon.).

Misapplications: Physcia astroidea (Clem.) Nyl. in Act. Soc. Linn. Bordeaux, vol. 21, 1856, p. 308; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 92.

Exsiccata: Claud. et Harm., Lich. Gall. exs., no 269; Desmazières, Pl. Cryptog. France, éd. 2, sér. 1, no 246; Erb. crittog. Ital., ser. 1, no 830; Harmand, Lich. Gall. rar., no 150bis; Hepp, Flecht. Europ., no 601; Körber, Lich. sel. Germ., no 303; Leighton, Lich. Brit. exs., no 324; Malbranche, Lich. Normand., no 171; Mougeot et Nestler, Stirp. Cryptog. Vogeso-Rhen., no 737; Schaerer, Lich. Helv. exs., no 610; Welwitsch, Cryptotheca Lusitana, no 104.

Iconography: Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 8, fig. 1; Smith et Sowerby, Engl. Bot., vol. 25, 1807, tab. 1779; Turner in Transact. Linn. Soc. London, vol. 9, 1808, tab. 13, fig. 1.

Macroscopical description — Thallus foliaceous, growing in rosettes, stellate, 3—5 cm in diam., attached to the substratum by means of rhizinae, more or less deeply incised. Lobes flaccid, 0.5—1 cm long and 0.3—0.6 mm broad, closely appressed, contiguous or overlapping, richly pinnatifid, plane or somewhat corrugated. Margins entire. Tips broadened and fan-shaped, crenate to deeply incised. Upper surface of the lobes almost white to light ash-grey, dull, epruinose, smooth to wrinkled or strongly lengthways rugged, almost without *isidia* to more or less densely *isidiate. Isidia* white, or grey, papillary and short, 0.1—0.2 mm broad, bursting at their apices and becoming coarsely servediose, eventually widening into irregular, crateriform, 0.5 mm wide *soralia.* The *soralia,* in their turn, may completely fuse into a continuous or areolate soredial crust which covers the whole upper side, only leaving free a narrow peripheral zone. Lower surface of the lobes white to pale brown, dull, plane, with scattered whitish or brownish, short rhizinae. *Microscopical description* — Upper cortex colourless or brownish, paraplectenchymatous, 20—30 μ, sometimes hardly distinguishable owing to the gonidia. Gonidia bright green, spherical, 8—11(—15) μ, arranged in clusters, deeply penetrating into the upper cortex and almost reaching the surface. Medulla colourless, white in reflected light, more or less densely plectenchymatous, 45—70 μ, consisting of leptodermatous hyphae. Lower cortex brownish or colourless with a brownish exterior zone, densely plectenchymatous, with the hyphae mainly parallel to the surface, here and there with transitions to paraplectenchyma, 18—30 μ, very gradually passing into the medulla which makes it difficult to rate the thickness of both lower cortex and medulla separately. *Apothecia* laminal, sessile, cup-shaped to discoid, 1—2(—2.5) mm in diam. Amphithecium concolorous with the thallus, dull, smooth. Margin persistent, entire, later on deeply crenulate or sometimes sorediate. Disc plane, becoming corrugated with age, dark brown to almost black, naked or covered with a dense bluish grey pruina. Epithecium brownish, hypothecium yellowish with some clusters of gonidia underneath. Hymenium colourless, 90—95 μ. Asci cylindrical to clavate, 14—17 × 63—78 μ, 8-spored. *Spores* brown, 2-celled, little or not constricted, ellipsoidal, straight, with rounded or slightly acute apices, with strongly thickened cell-walls at the septum and at the apices, 7.5—9 × 17—22 μ, not infrequently sterile. Paraphyses simple or furcate, septate, conglutinate, capitato-incrassate at the apices. *Pycnidia* not observed. *Chemical reactions* — Upper cortex K + yellow (owing to atranorin?), Pd + slowly yellow. Medulla K + yellow, Pd —.

Ecology and distribution in the Netherlands. *Ph. clementi* is a mainly arboricolous species which has been found to occur on *Fagus* (!), *Fraxinus, Populus, Quercus, Salix, Ulmus* and fruit trees; only once (1942) a specimen, which I refer with some doubt to the present species, was collected on the (tiled?) roof of a barn. It may be observed, however, that Borrer (in Smith et Sowerby, l. c.) is stated to have found the species "on trees and tiled roofs in Sussex", that Crombie in his Lichenes Brittannici, 1870, p. 39, reports *Ph. clementi* to occur "Ad arbores et saxa...", whilst Nádvorník (in Stud. Bot. Cechoslov., vol. 9, 1948, p. 147) also mentions a find on a "toit de tuiles".

From the presence of such accompanying species as *Ph. tenella, Xanthoria candelaria, X. parietina* and *Candelariella vitellina,* as well as from my own experiences in Ticino (Switzerland), it appears that *Ph. clementi* is a nitrophilous species.

Going by the scanty material extant in the herbarium, it may be assumed that the species was rare already in former times. Except for two recent finds, all collections were made in the former century.

Distribution in Europe. In Europe the species has a pronounced western and southern range, having been reported from southern Ireland, southern and central England, Belgium, western Germany, France, southernmost Switzerland, Austria, Portugal, Spain, Sardinia, Italy and Yugoslavia.

Remarks. In 1807 Clemente de Royas (or: de Roxas Clemente?) published his *Parmelia astroidea* (Essayo sobre las variedades de la vid comun que vegetan en Andalucia, 1807, p. 302). As may be inferred from the facts known, many years prior to his publication he had sent some specimens of a lichen to Turner in England which he had collected on olive-trees near Cadiz (cf. Turner in Transact. Linn. Soc. London, vol. 9, 1808, p. 147). This author thereupon made a description of the material (supplemented with collections from English localities) which, however, he was not to publish until 1808. In the mean-time he was preceded by Smith who in 1807 published his *Lichen Clementi*, referring to Turner's *Parmelia Clementi* mss. as a synonym.

Through the diligence and perseverance of Dr Tavares, I have been so fortunate as to be supplied with a typewrited copy of Clemente's description, from which it became instantly manifest that the species described by the latter has nothing whatever in common with that he had sent to England. Neither the description, nor the locality, nor the host-tree agree.

The first to misinterpret Clemente's species was Nylander (l. c., p. 308), as appears from his remark: "nec species sit autonoma, sed modo forma minor pro maxima parte leprose dissoluta praecedentis". He would not have considered *Parmelia astroidea* a sorediose form of *Ph. stellaris*, had he actually seen the original description.

Nylander was followed by Lynge who, not having seen Clemente's description either, briefly discussed the possibility of using the combination *Physcia Clementi*. Eventually he decided in favour of *Ph. astroidea*, advancing as his reasons that this was the name almost exclusively in use in German lichenological literature.

Since Clemente's description, which suggests some form of *Ph. pulverulenta*, may be equally inaccessible to others, the text as I received it is copied here in full.

> ...... **astroidea** — Thallo cartilagineo-membranaceo stellato glabro cinereo-fuscescenti, subtus fusco-nigricanti fibrilloso lacinis periphericis subimbricatis angustis multifidis adpressis planiusculis; scutellis concaviusculis tandem planis atris, margine subintegro albo-subfuscescente.
>
> *Thallus suborbicularis, laciniis quandoque margine subconnexis, humectatus colore servat. Scutellae magnitudine et forma ut in Parmelia leptalea, in centro subconfertae, nunquam pruinosae, omnino atrae; margine inflexo: seniores subcrenulatae, ob mutuam pressionem saepe irregulariter flexuosae, et nunquam convexae.* Cir. Cazalla at truncos quercus.

Several authors regard the plant completely devoid of isidia or with only a small number of them as the typical form. Beside it there is supposed to exist a "*Ph. astroidea* var. *caricae* (Ach.) Colmeiro" which should be characterised in that the thallus is almost completely covered with an isidiate-sorediate crust. The first objection that can be raised against maintaining this variety is that it is perfectly clear from the descriptions by both Smith and Turner, as well as from Sowerby's drawing and, above all, from Turner's superb plate, that the type itself is strongly sorediate, which renders the introduction of a separate varietal epithet superfluous.

Besides, there is something more. The first use of the epithet *caricae* has always been ascribed to Acharius, but this author himself (Syn. Meth. Lich., 1814, p. 188) refers to *Parmelia Caricae*. Clement. Ensay. etc. in Add. p. 302. Unfortunately, it occurred too late to me that I might need a copy of the description of this *Parmelia caricae* as well, but even if I would have had it, in this case it would be unwise to decide on the identity or non-identity from a description alone without having seen the material. Considering the trouble in securing a copy of the description of *P. astroidea,* the prospect of ever getting any authentic specimen does not seem very hopeful. However, if *Parmelia caricae* could be proved to be identical with *Lichen clementi,* and the date of publication of the former to be prior to that of the latter, the correct name for the present species would be *Physcia caricae.*

After having settled the matter of strongly sorediate plants, something remains to be said about little isidiate specimens. Lynge (l. c., p. 95) questions whether plants without isidia really exist, and if they do at all, he is inclined to consider them to belong to a related but separate species. He would not have come to this conclusion, had he known such South European specimens as are preserved in the Rijksherbarium: from Como, Italy, leg. ?; from Setubal, Portugal, leg. R. P. Valerio Cordeiro and issued in Harmand, Lich. Gall. rar., no 150bis; and from Olissip, Portugal, issued in Welwitsch, Cryptotheca Lusitana, no 104. Part of the specimens show numerous apothecia and most of them are notable in that they are almost devoid of isidia. Yet, their identity is beyond doubt. Furthermore, we possess some native material, one lot collected in 1842 by Van den Bosch near Zwake (island of Zuid-Beveland), the other in 1942 by Van Rossem near Lisse. In the Zwake collection one specimen is only sparingly isidiate, but some of the isidia have disintegrated, showing the characteristic crateriform soralia. The other specimen is almost devoid of isidia, possessing only a few soralia which reveal the identity of the species. The two specimens in the Lisse collection are very sparingly warty and show no soralia at all, which renders the identity somewhat doubtful. On account of their difference from other grey *Physciae,* however, I decided on their belonging to the present species.

The above may suffice to show that there is an appreciable variability as to the number of isidia and to the extent of the isidia turning sorediose. In this connection, too, it is of interest to draw the attention to *Ph. astroidea* f. *pollinifera* as described by Des Abbayes (in Bull. Soc. Sci. Natur. Ouest France, ser. 5, vol. 1, 1931, p. 81) which shows that even the outward appearance of the soralia and the size of the soredial granula are subject to some variability.

For a possible confusion of scantily isidiate specimens of *Ph. clementi* with other grey species, only those of subsection *Stellaris* are considered. *Ph. albinea* and *Ph. melops,* apart from being highly improbable for this country, may be told from *Ph. clementi* by the negative medullary reaction in the former, and the size and colour of the thallus in the latter. *Ph. biziana,* another species which is certain never to be found in Holland, may also be distinguished by the different medullary reaction upon K. In my opinion it is more especially with old and warty specimens of *stellaris* and *aipolia* that *clementi* may be confused. *Ph. stellaris* differs in the reaction of the medulla, as well as in the general appearance of the more convex lobes. *Ph. aipolia,* finally, may be told by the whitish pseudocyphellae and the thicker upper cortex.

It cannot be denied that densely sorediate *Ph. clementi* has some superficial resemblance to such strongly sorediate forms with short and contiguous lobes as occasionally occur in *Parmeliopsis aleurites.* Closer investigation, however, shows that differences are numerous. The tips of the lobes are somewhat scabrous and at the same time shiny in *aleurites,* smooth and dull in *clementi.* The isidia of *aleurites,* though turning sorediose, never form crateriform soralia and often have a brownish colour unknown in *clementi.* Both species differ from each other in the structure of their upper and lower cortices, and *aleurites* has a thinner upper cortex than *clementi. P. aleurites* contains lobaric acid which accounts for the medulla staining orange-red when treated with Pd; in *clementi* the medulla remains unaltered. Still more differences may, of course, be disclosed when taking the apothecia into consideration, but the above may suffice to tell the species apart when sterile.

Specimens examined.

Groningen: Groningen, *Acker Stratingh* (L).

Overijsel: Kampen, *Top* (NBV); Kampen, Zandberg, *Top* (NBV); IJselmuiden, *Bondam* (L, NBV).

Utrecht: Huis ter Heide, 15 VII 1861, *Van Hall,* c. ap. (NBV).

Noord-Holland: Amsterdam, Amsteldijk, I 1849, *Van der Sande Lacoste* (L, NBV); Amsterdam, Sloten, I 1849, *Van der Sande Lacoste* (NBV).

Zuid-Holland: Leiden, *Van den Bosch* (*Körber,* Typenherbar in L); Lisse, Keukenhof, 30 VII 1942, *Van Rossem 288c,* identity uncertain (L).

Zeeland: Zeeland, no locality, *Van den Bosch,* c. ap. (NBV); Zeeuws-Vlaanderen, Kloosterzande, 5 IV 1952, *Walrecht* (L); Zuid-Beveland, no locality, *Van den Bosch,* c. ap. (NBV); Zuid-Beveland, Noorddijk, IV 1841, *Van den Bosch,* c. ap. (NBV); Zuid-Beveland, Zwake, VI 1840, *Van den Bosch,* c. ap. (NBV); V 1842, *Van den Bosch* (L).

Noord-Brabant: Teteringen, 1852, unio NBV (L).

Subsectio 4. Tenella (Lynge) Maas G. nov. comb.

— *Physcia* subgen. *Brachysperma* sect. *Tenella* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 96; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 650.

Thallus small, 1—2 cm in diam., loosely adhering to ascending, light grey to ash-grey, *sorediate* or *esorediate,* with usually long marginal cilia. Upper cortex K + yellow.

Key to the species.

1a. Thallus sorediate 2
  2a. Soralia labriform . . . . . . **7. Ph. tenella** (Scop.) DC. sensu Bitt.
  2b. Soralia helmet-shaped, i. e. soredia produced in the interior of apical, inflated parts of the lobes . . . **6. Ph. adscendens** (Th. Fr.) Oliv. sensu Bitt.
1b. Thallus without soredia, nearly always with apothecia
5. Ph. leptalea (Ach.) DC.

5. **Physcia leptalea** (Ach.) DC. in Lam. et De Cand., Fl. Franç., ed. 3, vol. 2, 1805, p. 395; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 107; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 653 — *Lichen leptaleus* Ach., Lich. Suec. Prodr., 1798, p. 108 (pr. p.) — *Parmelia stellaris* var. *hispida* Fr., Lich. Europ. Reform., 1831, p. 82; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129 (pr. p.); Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 20 (pr. p.) — *Physcia hispida* var. *leptalea* A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 633 (ubi lit. et synon.).

Exsiccata: Desmazières, Pl. Cryptog. Nord France, no 146; Marcucci, Unio itin. cryptog., 1866, no XIX; Schaerer, Lich. Helv. exs., no 349, 562 (pr. p.); Welwitsch, Cryptotheca Lusitana, no 73.

Iconography: Cretzoiu in Inst. Cercetar. Experim. Forest., ser. 2, vol. 47, 1941, tab. 19; Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 31, fig. 188; tab. 34, fig. 204—212; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 7, fig. 3 and 4; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 13, fig. 4.

Macroscopical description — Thallus foliaceous, growing in rosettes, indistinctly stellate, small, 1—3 cm in diam., fixed to the substratum by a few rhizinae, deeply incised. Lobes little flexible, about 1 cm long and 0.4—0.8 mm broad, loosely attached to ascending, clearly discrete from centre to circumference (probably in young specimens) or contiguous (in older thalli?), in either case as a rule with side-lobes growing irregularly entangled, richly and irregularly furcate or pinnately branched, plane or convex, ciliate. Margins entire. Tips broadened up to 1—1.2 mm, fan-shaped, incised. Cilia marginal and terminal, 1—2(—3) mm long (in very old thalli they may be much shorter), simple or furcate, pale at the base, brown towards the apex. Upper surface of the lobes almost white to light ash-grey, dull, smooth or faintly indented, in older specimens becoming more and more warty and rugged, epruinose, without *isidia* or *soredia*, with more or less conspicuous light-coloured pseudocyphellae. Lower side white with a brownish tinge, dull, with a few pale rhizinae which have brownish apices. *Microscopical description* — Upper cortex colourless except for a broad brownish exterior zone, densely plectenchymatous, with the hyphae predominantly perpendicular to the surface, in older parts of the lobes sometimes very indistinctly paraplectenchymatous, 40—60 μ, with numerous ruptures into which clusters of gonidia penetrate. Gonidia bright green, spherical, 8—13 μ, arranged in a continuous stratum or in clusters of 25—40 μ, closely under the upper cortex or reaching as far as the surface. Medulla colourless, white in reflected light, more or less densely plectenchymatous, 60—100 μ, consisting of mesodermatous hyphae. Lower cortex colourless or with a narrow brownish exterior zone, very densely plectenchymatous, with the hyphae more or less parallel to the surface, gradually passing into the medulla, 25—75(—90) μ. *Apothecia* nearly always extant, sometimes numerous, laminal and marginal, sessile or shortly pedicellate, cup-shaped to discoid, 3—5 or even 8 mm in diam. Amphithecium concolorous with the thallus, dull, smooth or slightly wrinkled. Margin persistent, entire or minutely crenulate. Disc plane, much corrugated and torn with age, black-brown, naked or light caesio-pruinose. Epithecium brown-yellow, hypothecium yellowish, with a layer of gonidia underneath. Hymenium colourless, 75—85 μ. Asci cylindrical or somewhat clavate, 12—18 × 58—70 μ, 8-spored. *Spores* brown, 2-celled, with strongly thickened cell-walls at the septum and the apices, not constricted in the middle or slightly so, ellipsoidal, straight or curved, with rounded apices, 8.5—9.5 × (16—)18—22 μ. Paraphyses simple or furcate, septate, conglutinate, capitato-incrassate at the tips. *Pycnidia* common, laminal, scattered over the lobes as black dots or warts, spherical, pyriform or of variable shape, 200—240 μ in diam. Perifulcrium brownish. Ostiolum brown-black. *Pycno-*

conidia colourless, cylindrical, straight, 0.8 × 4—5 μ. *Chemical constituents* and *reactions* — Upper cortex K + yellow (probably owing to atranorin), Pd + slowly lemon-yellow. Medulla K —, Pd —.

Ecology and distribution in the Netherlands. *Ph. leptalea* is an arboricolous species which has been found on a great variety of trees such as *Alnus, Betula, Fraxinus, Pinus* (!), *Populus, Quercus, Salix, Sambucus* and *Ulmus,* as well as on lignum. From herbarium specimens it is apparent that the species was rather common formerly, but it has almost disappeared nowadays and recent finds are extremely rare. In this respect it behaves totally different from its relatives *Ph. adscendens* and *Ph. tenella.* If air pollution is the only factor to be blamed for its disappearance, the best chances of refinding the species will be along the coast and in the northeastern part of the country.

Distribution in Europe. According to the literature records cited on p. 280—284, the species is reported to occur in nearly all European countries on the understanding that it is most abundant in southern parts of Europe, becoming rarer farther north. In Scandinavia *Ph. leptalea* has a decidedly southern distribution, whereas even in in Denmark only a few localities are known. Inaccessibility to sufficient Polish literature may account for the fact that *Ph. leptalea* seems to be missing in Poland. On the other hand, it is significant that for Czechoslovakia Nádvorník (1947, p. 79) explicitly states: "C'est une plante du Midi, elle sera à peine trouvée dans nos pays..."

Remarks. From De Candolle's material which I have examined, it appears that this author's conception of the species perfectly agreed with our modern views.

In Lynge's description (l. c., p. 107) *Physcia leptalea* is said to have no rhizinae, but some of the exsiccata cited by this author do have rhizinae, although sparingly. For the matter of that, the difference between rhizinae and cilia does not seem quite so essential.

In working up the material, I was several times in doubt about how to discriminate between *leptalea* and *stellaris.* Sure enough, if well-developed, *leptalea* may at once be told from *stellaris* by its long marginal cilia and by its ascending lobes growing more entangled. But those cilia are not always too well-developed, frequently looking much like some rhizinae projecting sideways from the lobes, as they are also known to occur in *stellaris.* Then, the conspicuous pseudocyphellae of *leptalea* may serve as a character in separating the species from *stellaris,* but, again, they are not always distinct. Finally, we might take refuge to microscopical features, but here the difference is no decisive either. The upper cortex in *leptalea* is densely plectenchymatous with an occasional indication of palisade plectenchyma or indistinct paraplectenchyma even, whereas in *stellaris* it is palisade plectenchyma occasionally inclining to paraplectenchyma. Though Lynge rightly ranged *Ph. leptalea* in his section *Tenella,* it cannot be denied that the species unmistakably shows affinity to *Ph. stellaris.* As is the case in several other groups of closely related species, it may be difficult, if not quite impossible, to distinguish between both species occurring in an area where conditions apparently thwart the normal growth.

Variability. In Ann. Mycol., vol. 40, 1942, p. 187 Erichsen described *Ph. leptalea* var. *soralifera*. I examined the type specimen only to find that it is nothing but *Ph. tenella*, as was already pointed out by Nádvorník (in Stud. Bot. Cechoslov., vol. 8, 1947, p. 79).

var. *albescens* described by Olivier (in Rev. Bot., vol. 12, 1894, p. 87) is a slight colour modification characterised by the thallus being "d'un beau blanc de lait".

Specimens examined (recent finds only are considered).

Zuid-Holland: Wassenaar, Meiendel, 21 VI 1939, *Groot* (VS); 31 X 1940, *Maas G. 106*, c. ap. (L).

Zeeland: Schouwen, Haamstede, 18 IX 1951, *Barkman 2833*, c. ap. (L); Walcheren, Oostkapelle, 30 IV 1951, *Walrecht*, c. ap. (L).

6. **Physcia adscendens** (Th. Fr.) Oliv. sensu Bitt. in Pringsh., Jahrb. wiss. Bot., vol. 36, 1901, p. 431; Oliv., Fl. Lich. Orne, vol. 1, 1882, p. 79 (quoad nomen); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 588; vol. 8, 1932, p. 595 et vol. 10, 1940, p. 650 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 96 — *Lichen hispidus* Schreb., Spicil. Fl. Lips., 1771, p. 126 (incerte, non vidi) — *Physcia hispida* Frege, Deutschl. Bot. Taschenb., vol. 2, 1812, p. 169 (incerte, non vidi); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 626 (pr. p.) et vol. 10, 1940, p. 653 (pr. p.) — *Parmelia stellaris* var. *hispida* Fr., Lich. Europ. Reform., 1831, p. 82 (incerte); Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129 (pr. p.); Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 20 (pr. p.) — *Physcia stellaris* var. *adscendens* Th. Fr., Lich. Scand., vol. 1, 1871, p. 138 (incerte).

Exsiccata: Arnold, Lich. exs., no 920; Claud. et Harm., Lich. Gall. exs., no 128; Hepp, Flecht. Europ., no 879; Leighton, Lich. Brit. exs., no 174; Kryptog. exs. Vindob., no 248 et 880; Magnusson, Lich. sel. scand. exs., no 413; Malbranche, Lich. Normand., no 71 (pr. p. *Ph. tenella*); Mougeot et Nestler, Stirp. Cryptog. Vogeso-Rhen., no 450 (pr. p.); Rabenhorst, Lich. Europ., no 378; Schaerer, Lich. Helv. exs., no 352.

Iconography: Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tabl. 30, fig. 1 (indistinct) et 2; Bitter in Pringsh., Jahrb. wiss. Bot., vol. 36, 1901, tab. 12, fig. 58; Cretzoiu in Inst. Cercetar. Experim. Forest., ser. 2, vol. 47, 1941, tab. 18, fig. 2; Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 31—32, fig. 183—186, 189—193; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 6, fig. 1, 3 et 4; Magnusson, Fl. Skand. Busk- och Bladlav., 1929, tab. 2, fig. 13 (indistinct); Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 13, fig. 5 (indistinct); Smith et Sowerby, Engl. Bot., vol. 19, 1804, tab. 1351.

Macroscopical description — Thallus foliaceous, originally growing in rosettes and more or less distinctly stellate, small, 1—2 or at most 3 cm in diam., later on fusing with other thalli into larger swards, fixed to the substratum by rhizinae and cilia, deeply incised. Lobes flexible, long and narrow or short and broad, 1—1.5 cm long, 0.3—1 mm broad, usually discrete from centre to circumference, growing entangled with age, richly and irregularly pinnately branched, plane at the tips, more convex towards the centre, ciliate, *sorediate*. Cilia marginal and apical, 1—2 mm long, simple, pale with brownish or blackish tips or dark brown all over. Not always are the cilia marginal, quite frequently they are also inserted on the underside of the thallus, and equally often they behave as plain rhizinae, attaching the thallus to the substratum instead of projecting sideways into the air. Tips of the esorediate lobes little ascending and little or not broadened, rounded or incised; tips of the *sorediate* lobes ascending or upright, broadened to 1.5—2 mm, with a markedly inflated, helmet-shaped dilatation, at the inside of which the *soredia* are produced (*soralia forniciformia*). In the course of their development, these helmets become more and more lumpy, getting perforated and, eventually, completely disintegrating by the progress of soredial production. Upper side of the lobes white-grey, pale bluish grey to ash-grey, mostly paler at the tips and the helmet, dull, smooth, often becoming warty or wrinkled in the centre of older thalli, without *isidia,* sometimes slightly pruinose (especially in specimens growing on calcareous substrata), either with or without indistinct light dots, owing to the unequal depth of the clusters of gonidia under the cortex. Underside white, dull, more or less canaliculate, with a few rhizinae (and cilia). *Microscopical description* — Upper cortex colourless except for a broad brownish exterior zone, densely plectenchymatous, with the hyphae predominantly perpendicular to the surface, gradually passing into paraplectenchyma in older parts of the lobe, 45—60 μ, with numerous narrow ruptures into which the gonidia penetrate. Gonidia bright green, spherical, 9—15 (—18) μ, arranged in clusters or in a continuous layer of 20—50 μ, closely under the cortex, filling up the whole medullary stratum in the ascending lobes. Medulla colourless, white in reflected light, more or less densely plectenchymatous, 30—60 μ, but locally also lacking, consisting of mesodermatous hyphae. Lower cortex colourless, with narrow or broad brownish exterior zone, very densely plectenchymatous, with the hyphae fairly parallel to the surface, gradually passing into the medulla and sometimes connected with the upper cortex by strands, 60—120 μ. *Apothecia* rare and occurring in small numbers, laminal, sessile or pedicellate, cup-shaped to discoid, 1—2 mm in diam. Amphithecium concolorous with the thallus, dull, smooth. Margin persistent, entire or crenate. Disc plane, red-brown to black-brown, naked or light caesio-pruinose. Epithecium brown-yellow, hypothecium yellowish or colourless, with a layer of gonidia underneath. Hymenium colourless, 75—85 μ. Asci cylindrical to clavate, 10—16 × 54—65 μ, 8-spored. *Spores* olive-brown, 2-celled, little constricted in the centre, ellipsoidal, straight or curved, with strongly thickened cell-walls at the septum and the rounded apices, 7—9 × 15—18 μ. Paraphyses simple or furcate, septate, conglutinate, capitato-incrassate at the apices. *Pycnidia* rather common, laminal, scattered over the lobes, single or in small groups, visible as small black warts, spherical, ellipsoidal or pyriform, 50—110 × 100—140 μ. Perifulcrium colourless or brownish. Ostiolum brown-black. *Pycnoconidia* colourless, cylindrical, straight, ± 0.8 × 3.5—4 μ. *Chemical reactions* — Upper cortex K + yellow (owing to atranorin?), Pd + more or less vivid lemon-yellow, less distinct in dark thalli. Medulla K —, Pd —.

Ecology and distribution in the Netherlands. *Ph. adscendens* is equally common on stony substrata as on the bark of trees or the wood of fences and the like. It has been found on roofing tiles, bricks, sandstone, masonry, concrete, as well as on *Acer, Aesculus, Betula, Fagus, Platanus,* dead twigs of *Picea, Quercus, Salix* and *Sorbus.*

Most favoured host-trees, however, are *Populus*, *Ulmus* and fruit trees. It prefers exposed habitats rich in nitrogen compounds, and in fact does not shun the vicinity of human dwellings. One of our commonest species.

Distribution in Europe. The species is common all over Europe.

Remarks. It appears from the ample and critical considerations by Lynge (l. c., p. 96) how complicated and inextricable the synonymy of this species is. Yet, we should not, in trying to escape the difficulties, omit the names of the early authors. The writing, for instance, of *Ph. adscendens* Bitter has no nomenclatural status since it is illegitimate. The first author from whom the epithet *adscendens* originates is Th. Fries. To be sure, this author refers to his father, Elias Magnus Fries, but, as pointed out by Lynge, Fries's *Parmelia stellaris* var. *adscendens* (in Summa Veg. Scand., sect. 1, 1846, p. 105) is a nomen nudum. The first to make the combination *Ph. adscendens* has been Olivier, but it is clear that this author had a wider conception of the species, for our genuine *adscendens* is called *adscendens* var. *tenella* by him: "laciniures à extrémitées recourbées en forme de capuchon..." Eventually, it was Bitter (l. c.) who had a clear comprehension of the confusion showing the difference between *adscendens* and *tenella*.

Though Schreber's *Lichen hispidus* might have been the first binomial used for the present species, Lynge was perfectly right in entirely disregarding it. It is no use indeed to try to reintroduce such a highly uncertain epithet instead of another which has become widely familiar and established. Moreover, the authentic material of *Lichen hispidus* seems to have gone lost; it is not in the München herbarium, as I have been informed.

As already stated by Lynge (l. c., p. 101), scrupulous observation is needed in distinguishing *Ph. leptalea* from young specimens of *Ph. adscendens* whose helmets have not yet developed. The only anatomical difference seems to be in the upper cortex which in older parts of the lobes turns more distinctly paraplectenchymatous in *adscendens* than in *leptalea*.

On the other hand, the helmets of *adscendens* may in such a manner be affected and corroded by the soredial production as to deceivingly resemble the labriform soralia of *tenella*.

In this connection it may be remembered that Anders (Strauch- u. Laubfl. Mitteleurop., 1928, p. 198) actually considered *adscendens* and *tenella* (as well as *leptalea*) to be mere forms of one and the same species. Even to-day this belief is occasionally upheld, and I fully admit that under circumstances it may be exceedingly difficult to tell both species apart. In this connection I may also refer to Kusan's remark in Hedwigia, vol. 74, 1935, p. 296. Anatomically I can find no appreciable difference, but the two species differ in the development of their soralia. Although Bitter (l. c., p. 432—433) gave a description of these organs, there is a detail which I wish to be stressed more explicitly.

When in *tenella* the soredia are being formed, medulla and lower cortex alike are destroyed, whereas the upper cortex, arching upwards, holds out longest. This results in the sorediferous part of the lobe showing an oblique face which, owing to the vaulting of the upper cortex, may become somewhat concave, but never becomes a cavity. A longitudinal section of such a lobe is well depicted in fig. 2 of Bitter's paper.

The soredial production in *Ph. adscendens* is initiated by the appearance of a slit at the very tip of the lobe on the borderline between upper and lower cortex. As the slit widens, partly through the tearing apart of the tissue of both upper and lower cortex, partly also somewhat at the cost of the lower cortex, the upper side of the tip of the lobe starts arching upwards, eventually causing a considerable swelling. The soredia are produced in the interior of the swelling, consuming in the process all the medullary tissue available, but both upper and lower cortex remain untouched. Only in much later stages the upper cortex becomes perforated, and gradually crumbles away before the destructive action of the soredial production, soon followed by the lower cortex. It is in such a stage, as already referred to above, that the sorediferous part of the lobe very much resembles the lip-shaped soralium of *Ph. tenella.* Generally, however, there are at least a few lobes in a less advanced stage, showing the critical points which enable us to distinguish *tenella* (sorediferous part of the lobe on a solid, slanting face, and the lower cortex bordering at the sorediose mass) from *adscendens* (sorediferous part within an inflated cavity and the lower cortex clean-cut, with no soredia visible at its margin).

Variability. Specimens growing horizontally usually retain their orbicular form, but in very old specimens the centre may die off, leaving a ring-shaped thallus. Possibly this is the stage called f. *orbicularis* by Bouly de Lesdain (Rech. Lich. Dunkerque, 1910, p. 109).

Thalli exposed to the sun are more white, whereas plants from shaded habitats are more ash-grey.

Pruinose thalli do occur, in contradistinction to Lynge's statement (l. c., p. 100), but they are rare and only occur on concrete or masonry.

In old specimens, after soredial production has entirely consumed the apical helmets, the remainder of the lobes may become plane or concave or even curl upwards at their tips in imitation of the sorediferous lobes in *Ph. tenella.* Perhaps this is f. *distracta* Lettau as described in Hedwigia, vol. 52, 1912, p. 253, but it is difficult to ascertain the identity without having seen the authentic material which at the moment is not available (Mattick in litt.).

As to the general habitus and the width of the lobes, this species may vary not inconsiderably, but I shall refrain from describing forms.

Some more forms have recently been described by Nádvorník in Stud. Bot. Cechoslov., vol. 8, 1947, p. 78 and in vol. 9, 1948, p. 147.

7. **Physcia tenella** (Scop.) DC. sensu Bitt. in Pringsh., Jahrb. wiss. Bot., vol. 36, 1901, p. 431; DC. in Lam. et De Cand., Fl. Franç. ed. 3, vol. 2, 1805, p. 396 (quoad nomen); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 101; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 655 (ubi lit.) — *Lichen hispidus* Schreb., Spicil. Fl. Lips., 1771, p. 126 (incerte, non vidi) — *Lichen tenellus* Scop., Fl. Carniol., ed. 2, vol. 2, 1772, p. 394 (incerte) — *Physcia hispida* Frege, Deutschl. Bot. Taschenb., vol. 2, 1812, p. 169 (incerte, non vidi); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 626 (pr. p.) et vol. 10, 1940, p. 653 (pr. p.; ubi lit.

et synon.) — *Parmelia stellaris* var. *hispida* Fr., Lich. Europ. Reform., 1831, p. 82 (incerte); Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129 (pr. p.); Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 20 (pr. p.).

Exsiccata: Floerke, Deutsch Lich., no 73; Havås, Lich. Norveg. occid., no 111; Malbranche, Lich. Normand., no 170 (pr. p.); Reichenb. et Schub., Lich. exs., no 37; Stenhammar, Lich. Suec. exs., no 212 inf. (pr. p.).

Iconography: Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 29—30, fig. 172—182; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 7, fig. 1—2; Magnusson, Fl. Skand. Busk- och Bladlav., 1929, tab. 2, fig. 14.

Macroscopical description — Thallus foliaceous, growing in rosettes when young and more or less stellate, small, 1—2 cm in diam., later on fusing with other thalli into large, irregular swards, attached to the substratum by rhizinae and cilia, deeply incised. Lobes rather flexible, long and narrow or short and broad, up to 1 cm long and 0.2—1 mm broad, clearly discrete from centre to circumference or somewhat contiguous in forms with broad lobes, frequently covering each other, growing entangled with age, richly and irregularly furcate or pinnatifid, plane at the tips, more or less convex towards the centre of the thallus, ciliate, *sorediate*. Cilia marginal and apical, 0.5—1 or even 2 mm long, simple or furcate, pale with dark tips or dark all over. Esorediate lobes chiefly at the circumference of the thallus, loosely attached, with little or not broadened, crenate or incised tips. Sorediate lobes in young specimens only in the centre of the thallus, later on occurring all over the thallus, ascending, with fan-shaped, up to 1.5 or 2 mm broad, concave or flexuous tips. Upper surface of the lobes light grey to ash-grey, dull, smooth or becoming somewhat indented or wrinkled in the centre of the thallus, without pruina or *isidia*. *Soralia* lip-shaped, apical, white or greenish white. Owing to the corrosive soredial production, the lobes are gradually worn away farther backwards, so that the soralia, originally situated at the tips of the side-lobes, recede as far back as the main lobe, making the impression of being maculiform. Finally, they may fuse into larger sorediate complexes. Under surface of the lobes white, dull, more or less canaliculate, sparingly set with rhizinae and cilia. *Microscopical description* — Upper cortex colourless except for a broad brownish exterior zone, densely plectenchymatous in the youngest parts of the lobes, afterwards becoming paraplectenchymatous, 25—60 μ, here and there interrupted by clusters of gonidia. Gonidia bright green, spherical, 7—15(—18) μ, arranged in clusters or in a continuous layer of 30—60 μ, closely under the upper cortex or reaching the surface, scattered throughout the medullary layer in the ascending lobes or even occurring under the lower cortex. Medulla colourless, white in reflected light, more or less densely plectenchymatous, 20—70 μ, consisting of meso-leptodermatous hyphae. Lower cortex colourless or with a narrow brownish exterior zone, very densely plectenchymatous, gradually passing into the medulla, 27—60 μ. *Apothecia* common and usually in great numbers, laminal, sessile or shortly pedicellate, cup-shaped to discoid, 1—3(—3.5) mm in diam. Amphithecium of the same colour as the thallus, dull, smooth, once or twice seen with a rhizine. Margin persistent, entire but becoming crenate or lobate or even sorediate. Disc plane or wavy, dark brown to almost black, epruinose or, very rarely, pruinose in young apothecia. Epithecium brownish, hypothecium colourless, with clusters of gonidia underneath. Hymenium colourless, 60—85 μ. Asci cylindrical to clavate, 12—15(—18) × 54—75 μ, octosporous. *Spores* olive-brown, 2-celled, more or less constricted, ellipsoidal, straight or somewhat curved, with strongly thickened cell-walls at the septum and the rounded apices, 9—10(—11) × (15—)17—19(—21) μ. Paraphyses simple or furcate, septate, conglutinate, capitato-incrassate at the apices. *Pycnidia* common, laminal, single or in small groups, visible as black warts, pyriform or ellipsoidal, 90—155 × 180—195 μ. Perifulcrium brownish to brown-black. Ostiolum brown-black. *Pycnoconidia* colourless, cylindrical, straight, ± 0.8 × 3—3.5 μ. *Chemical constituents* and *reactions* — Upper cortex K + yellow, Pd + more or less vivid lemon-yellow. Medulla K —, Pd —. According to Zopf (Flechtenstoffe, 1907, p. 226 and 415), *Ph. tenella* would contain atranorin ($C_{19}H_{18}O_8$), but it is not certain whether Zopf already distinguished between *Ph. tenella* and *Ph. adscendens.*

Ecology and distribution in the Netherlands. Occurring on much the same places as *Ph. adscendens,* in whose company it is usually found, *Ph. tenella* is even more abundant than that species.

Distribution in Europe. Common throughout Europe, though Nádvorník's remark (in Stud. Bot. Cechoslov., vol. 8, 1947, p. 78) shows that the species locally may be not so common as *Ph. adscendens.*

Remarks. Nomenclaturally *Ph. tenella* offers much the same difficulties as *Ph. adscendens,* and it is with good reason that Lynge wrote (in Vid. Selsk. Skr., Mat.-Naturvid. Kl., vol. 1, 1916, p. 39) "The synonymy of this species is very intricate and the priority cannot be decided without a study of the authentic specimens of early authors." As for the authentic material of *Lichen tenellus,* I have been informed that it is not present in the herbarium in Pavia. The original diagnosis hardly gives a clue and rather suggests that Scopoli might have described a mixture of *Ph. tenella* and *adscendens,* the words "apice dilatata, ... tumida" referring to the latter, but "crenata" and "reflexa" more to the former, although it cannot be denied that in very old thalli of *adscendens* the tips of the somediferous lobes may be reflexed.

There is no doubt that the second author, De Candolle, in making the combination *Ph. tenella,* entirely misunderstood the species as is perfectly clear from his diagnosis: "... divisés en lobes rameux, obtus, relevés en voûte...". The material in Herb. De Candolle is a mixture of *Ph. adscendens,* some *leptalea* and *stellaris.* Yet, it would be wrong to omit the author's name, since it is the combination that matters, not the material.

The marginal cilia in old specimens and in plants occurring in exposed habitats may be very short if not lacking altogether which, to a highly confusing extent, makes *tenella* resemble species of the *Tribacia*-group. Lynge accordingly remarks "Schwieriger ist die Unterscheidung von *Physcia dubia*" (l. c., p. 104). As to the difference, I may refer to that species.

Very young specimens of *tenella* in which the soredia have not yet developed may be mistaken for *leptalea.* A good character is the upper cortex which in *tenella* soon becomes paraplectenchymatous, but remains plectenchymatous or, at the most, turns very indistinctly paraplectenchymatous in *leptalea*.

Old thalli of *tenella* may also greatly resemble worn-out and corroded thalli of *adscendens*, but it seldom happens that one cannot find some less advanced lobes showing the specific characters as expressed under *Ph. adscendens* (p. 238). As an auxiliary character may be regarded the apothecial disc which is nearly always naked in the case of *tenella*, and usually but not always pruinose in *adscendens*. For the rest, not too much importance can be contributed to this point of difference, since the presence of apothecia, at least in this country, is not a rule, especially not in *adscendens*. That is why dimensions of spores also are less useful. Moreover, I have come to results contrary to those mentioned by Lynge. On an average it is exactly of *tenella* that I have found the spores to be somewhat longer and broader.

As to the colour of the upper side of the thallus, I cannot as far as the Dutch material is concerned confirm the statement by Lynge (l. c., p. 101) that *adscendens* should be lighter than *tenella*; the reverse is quite as common.

Variability. As to the ratio of length and width of the lobes, the present species is fairly variable. Also the length of the cilia, the soralia, as well as the extent of the lobes being consumed by soredial production are subject to variability, and some forms have been described accordingly. A slight modification is f. *subbreviata* Nyl. (in Flora, vol. 65, 1882, p. 456) which has short, broad, somewhat ascending lobes.

In Ann. Mycol., vol. 40, 1942, p. 186 Erichsen described f. *pseudisidiata* and var. *revoluta*. The former is characterised by the production of coarse-grained soredia, whereas the soralia, after having consumed the side-lobes, soon turn to the main lobes. In var. *revoluta* the soralia are broad and strongly reflexed. I have seen the authentic specimens.

Some more forms have been described by Nádvorník in Stud. Bot. Cechoslov., vol. 9, 1948, p. 147 (var. *astroioides*) and p. 148 (f. *anaptychioides*).

In the same journal vol. 8, 1947, p. 78, Nádvorník mentions a f. *perisidiosa* which he ascribes to Erichsen in Ann. Mycol., 1942, p. 187. Here Erichsen enumerates his *Ph. perisidiosa* which he had described in Verh. Bot. Ver. Prov. Brandenburg, vol. 72, 1930, p. 57, considering it related to *Ph. pulverulenta*. Apparently, f. *perisidiosa* is to be taken for a slip, since *Ph. perisidiosa* again occurs in Nádvorník's paper on p. 120 as a basinym for a new combination.

Subsectio 5. Tribacia (Lynge) Maas G. nov. comb.

— *Physcia* subgen. *Brachysperma* sect. *Tribacia* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 110; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 650.

Thallus small to medium, 2—4 cm in diam., appressed to loosely attached, with the tips of the lobes usually free from the substratum or ascending, light grey to ash-grey, without cilia or *isidia, sorediate*. Upper cortex K + yellow.

Key to the species.

1a. Medulla K + yellow. Pseudocyphellae distinct . . . **8. Ph. wainioi** Räs.
1b. Medulla K —. No pseudocyphellae 2
  2a. Lobes comparatively narrow, margin entire, soralia apical and labriform **9. Ph. dubia** (Hoffm.) Lettau
  2b. Lobes comparatively broad, margin crenate, soredia marginal, sometimes confluent, never labriform . . . . **10. Ph. tribacia** (Ach.) Nyl.

8. **Physcia wainioi** Räs. in Medd. Soc. F. Fl. Fenn., vol. 46, 1921, p. 166; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 703 — *Physcia tribacoides* var. *caesiella* Bouly de Lesd. in Bull. Soc. Bot. France, vol. 53, 1906, p. 515; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 696 (ubi lit.) — *Physcia caesiella* (Bouly de Lesd.) Suza, Zajémavé nálezy lisejniku v Ceskoslovensku, 1929, p. 9—11 (non vidi); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 117; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 651.

Iconography: Dahl in Nytt Mag. Naturvid., vol. 78, 1938, p. 133.

Macroscopical description — Thallus foliaceous, growing in rosettes, stellate when young, later on more irregular, rather small, 1.5—3 cm in diam., merging with other thalli into larger expanses, attached to the substratum by rhizinae, deeply incised. Lobes fairly rigid, long and narrow, 0.5—1 cm long, 0.5—0.8 mm broad, closely appressed, somewhat discrete to contiguous, richly and irregularly pinnately branched, plane to somewhat corrugated. Margins entire or faintly undulate and notched. Tips broadened up to 1 mm, crenulate to deeply incised. Upper surface light grey to ash-grey with a brownish purple hue towards the centre of the thallus, dull, smooth, without pruina or *isidia*, but with numerous whitish, irregularly shaped pseudocyphellae, *sorediate*. *Lip-shaped soralia* marginal and apical, little raised, 0.4—0.8 mm broad, whitish. By further expansion over the upper surface of the lobe they may seem laminal. *Maculiform soralia* rather rare, laminal, whitish and as broad as the labriform soralia. Lower surface dingy white to brownish, dull, smooth, plane, more or less covered with black-brown, simple or furcate rhizinae. *Microscopical description* — Upper cortex colourless with a yellow-brown outer zone, paraplectenchymatous, 65—90 μ, with numerous ruptures (pseudocyphellae). Gonidia bright green, broadly ellipsoidal to spherical, 6—9 × 7—16 μ, arranged in more or less dense clusters of 30—60 μ. Medulla colourless, white in reflected light, densely plectenchymatous, 30—70 or even 120 μ, composed of lepto-mesodermatous hyphae. Lower cortex colourless or with a narrow brownish outer zone, very densely plectenchymatous, with the hyphae mainly arranged in a direction parallel to the surface, (24—)30—60 μ, more or less gradually passing into the medulla. *Apothecia* and *pycnidia* not observed. *Chemical constituents* and *reactions* — Upper cortex K + yellow, Pd + yellow. Medulla K + yellow, Pd —. The staining of the thallus on application of K may point to the presence of atranorin.

Ecology and distribution in the Netherlands. The species is reported to grow on rock as well as occasionally on trees or mosses (Dahl in Nytt Mag. Naturvid., vol. 78, 1938, p. 135 and Nádvorník in Stud. Bot. Cechoslov., vol. 8, 1947, p. 87). I collected my specimens from a granite boulder only little above water level of the IJselmeer.

It is probably only because of the lack of natural substrata suitable for this species that *Ph. wainioi* is rare in our country. Since granite and basalt are mainly used for the reinforcement of our dikes, it is here that the species should be looked for.

Distribution in Europe. The find of *Ph. wainioi* in Holland is of some interest in relation to its distribution in Europe. As may be gathered from the paper by Schade (in Beih. Bot. Centralbl., vol. 58B, 1938, p. 55—99), the majority of localities were up till his time reported from areas south of latitude 51° N., namely 15 from Saxony, 37 from Czechoslovakia, 1 from Galicia as well as Ukrainia, 13 from Hungary, 3 from the Transsylvanian Alps, 4 from the Alps (Styria, southern Tyrol, Switzerland), 5 from France. North of this latitude only three more localities were recorded, viz. 2 in Germany (Brandenburg) and 1 in Sweden (Uppland). In the light of our present knowledge, however, it is obvious that this 51° line is quite meaningless in connection with the distribution of the species. It may suffice to quote some authors without going into further detail of the great number of localities mentioned by them. They are Ahlner (in Svensk Bot. Tidskr., vol. 35, 1941, p. 269), Albertson (in Act. Phytogeogr. Suec., vol. 20, 1946, p. 223), Christiansen (in Bot. Tidsskr., vol. 48, 1946, p. 84), Dahl (l. c., p. 135—136), Degelius (in Nytt Mag. Naturvid., vol. 78, 1938, p. 290; Uppsala Univers. Årsskr., 1939, no 11, p. 198; Svensk Bot. Tidskr., vol. 36, 1942, p. 47; ibidem, vol. 38, 1944, p. 61; ibidem, vol. 39, 1945, p. 41), Duvigneaud (in Bull. Soc. Roy. Bot. Belg., vol. 70, 1938, p. 167), Erichsen (in Ann. Mycol., vol. 40, 1943, p. 187), Gelting (in Bot. Tidsskr., vol. 44, 1938, p. 358; ibidem, vol. 45, 1941, p. 408), Hasselrot (in Bot. Notis., 1942, p. 305), Håkanson (in Svensk Bot. Tidskr., vol. 44, 1950, p. 229), Magnusson (in Bot. Notis., 1942, p. 18; Ark. f. Bot., vol. 33A, 1946, no 1, p. 142), Räsänen (in Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo, vol. 12, 1939. no 1, p. 96). Certainly, the species is widely distributed in Europe and it may be only a matter of time before it will be recorded from such countries as Italy, Iberian Peninsula, Great Britain and Ireland.

Remarks. Until Dahl (l. c., p. 131) had shown the identity of *Ph. caesiella* and *Ph. wainioi*, the species was commonly known under the former epithet.

On comparison of the specimens found by me with the description given by Lynge, it appears that scattered over the lobes there are a few very distinct laminal soralia which were not mentioned by that author. One need not wonder at this discrepancy, since two different types of soralia are also known in other species of this subsection, viz. in *Ph. intermedia*. *Ph. teretiuscula*, too, is reported to have apical lip-shaped soralia, but "... mitunter beobachtet man auch ganz kleine, flächenständige Warzensorale" (Lynge, l. c., p. 119). Very convincing pictures of this type of soralia in *teretiuscula* may moreover be found in Galløe's outstanding work Natural History of the Danish Lichens, vol. 8, 1950. tab. 26 and 28. It is very interesting, therefore, to learn that Dahl (l. c., p. 133) and Degelius (in Nytt Mag. Naturvid., vol. 78, 1938, p. 290) also found laminal soralia in *Ph. wainioi*. In contrast to Degelius's assumption, however, I consider *Ph. wainioi* perfectly able to develop genuine laminal soralia which are not the result of an extended erosive action of the marginal soralia, since I have seen the former without any connection whatever with the latter.

On account of the type of the soralia and the anatomical features of the apothecium, especially the paraphyses, which would resemble those found in subsection *Caesia,* rather than those in subsection *Tribacia,* Dahl refers *Ph. wainioi* to the former subsection. As to the paraphyses, I have not been able to observe any difference. With regard to the terminal soralia, Dahl remarks that they are not of the lip-shaped type, since "they leave the cortex of the under side intact to the very apex of the lobes". True, but irrelevant. According to Du Rietz's definition (in Svensk Bot. Tidskr., vol. 18, 1924, p. 380), labriform soralia "entstehen apikal an der Spitze der Lappen ..., vergrössern sich ... als eine plane oder konkave Fläche, welche das obere und das untere Ende der nichtsorediösen Rindenpartien auseinanderschiebt". This is wat happens in *Ph. wainioi,* only the labriform soralia are not confined to the tips of the lobes, but develop on the margins as well. In an early stage of the soralium, the upper cortex bulges and continues to move away from the lower cortex so as to form a lip which sooner or later curls upward. The lip may remain visible for some time. In other cases it is consumed very quickly by the soredial production which makes the labriform soralium resemble a maculiform one, the more so, since the soralium tends to shift its originally vertical position into a horizontal one. However, apart from the question what name might be applied to this type of soralia, it should be borne in mind that this type is common in subsection *Tribacia,* whereas it is not found in subsection *Caesia.*

In the laminal maculiform soralia, the pseudocyphellae and the general outward appearance *Ph. wainioi* resembles very much *Ph. caesia.* The latter, however, has more globose soralia and lacks the lip-shaped soralia. From *dubia* the species may be told by its pseudocyphellae, the thicker upper cortex and the positive reaction of the medulla upon K.

Specimen examined.
Gelderland: Hoef, 25 X 1941, *Maas G. 1660* (L).

9. **Physcia dubia** (Hoffm.) Lettau in Hedwigia, vol. 52, 1912, p. 254; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 110 (exclus. f. *lata*); A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 652 (exclus. f. *lata*) — *Lobaria dubia* Hoffm., Deutschl. Fl., vol. 2, 1795, p. 156 — *Physcia caesia* var. *dubia* (Hoffm.) Th. Fr., Lich. Scand., vol. 1, 1871, p. 141; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 605 (ubi lit. et synon.) — *Physcia dubia* f. *angusta* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 116.

Exsiccata: Arnold, Lich. exs., no 429, 745, 787, 787b; Floerke, Deutsche Lich., no 72; Funck, Cryptog. Gew. Fichtelgeb., no 417 (pr. p. *Ph. caesia*); Havaas, Lich. Norveg., no 110; Kryptog. exs. Vindob., no 2290; Leighton, Lich. Brit. exs., no 266; Mougeot et Nestler, Stirp. Cryptog. Vogeso-Rhen., no 447.

Iconography: Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 24—25, fig. 146—152; Lynge in Vid. Sellsk. Skr., Mat.-Naturvid. Kl., vol. 1, 1916, tab. 2, fig. 3 et in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 9, fig. 1, 4; Rieber, Zur Flechtenfl. Ehingen, 1901, fig. infima dextr. (incerte).

Macroscopical description — Thallus foliaceous, growing in rosettes, stellate, becoming more irregular with age, rather small, 1.5—3 cm in diam., fusing with other thalli into larger swards, attached to the substratum by rhizinae, deeply incised. Lobes fairly flexible, long and narrow, 0.5—1.5 cm long, 0.4—0.8 mm broad, closely appressed, contiguous or overlapping, richly and irregularly furcate or pinnatifid, plane at the tips, more or less convex towards the centre. Margins entire. Tips not or slightly broadened, crenate to strongly incised, usually ascending. Upper side of the lobes white-grey to ash-grey, dull, epruinose or with a faint whitish pruina, smooth or wrinkly-rugged, without *isidia*, *sorediate*. *Soralia* labriform, terminal at the tips of the side lobes, later on also at the main lobes, short, dark grey to white, in the course of their development destroying the side lobes which shorten gradually, and eventually reaching the main lobes. This process results in the soralia uniting into a broad, wavy, sorediose fringe bordering the main lobes. Lower surface of the lobes white to dirty white, dull, smooth, plane at the tips, growing more canaliculate towards the centre of the thallus, with scattered, pale or brownish, simple or furcate rhizinae. *Microscopical description* — Upper cortex colourless except for a broad exterior zone which again is covered with a crumbly layer, paraplectenchymatous, 40—60 μ. Gonidia bright green, spherical, (6—)10—15(—18) μ, arranged in dense clusters or in a continuous stratum of 40—90 μ, closely under the upper cortex, in places penetrating into it. Medulla colourless, white in reflected light, more or less densely plectenchymatous, (20—)30—60(—120) μ, composed of mesodermatous hyphae, scarcely marked off from the lower cortex. Lower cortex colourless or with a narrow brownish outer zone, very densely plectenchymatous, 30—75 μ; very rarely the exterior zone is seen to form a paraplectenchyma. *Apothecia* very rare, not found any more in recent times, laminal, sessile, cup-shaped to discoid, 1.5—2.5 mm in diam. Amphithecium concolorous with the thallus, dull, smooth. Margin persistent, entire or somewhat crenulate. Disc plane, black-brown, epruinose. Epithecium brown-yellow, hypothecium colourless to yellowish, with clusters of gonidia underneath. Hymenium colourless, about 70 μ. Asci clavate, 12—14 × 45—60 μ, octosporous. *Spores* olive-brown, 2-celled, not or little constricted in the centre, ellipsoidal, straight or fabiform, with strongly thickened cell-walls at the septum and the rounded apices, 6—8 × (15—)17—20 μ. Paraphyses simple or furcate, septate, conglutinate, capitato-incrassate at the apices. *Pycnidia* not observed. *Chemical reactions* — Upper cortex K + yellow (presumably owing to atranorine), Pd + slowly yellow. Medulla K —, Pd —.

Ecology and distribution in the Netherlands. In a few cases *Ph. dubia* has been found on a wooden fence, once on the bark of *Ulmus* and once on that of *Acer*. Otherwise it is a saxicolous species which has been collected on bricks, roofing tiles and granite. In nature it is often found in company of *Ph. caesia*, and, like this species, *dubia* does not shun the neighbourhood of human dwellings. I have collected fine specimens in the centre of towns and once on a factory-wall near a railway-yard. From its usual substratum the species may grow over mosses. *Ph. dubia* is far from common in this country, even if it is true that the species is liable to be easily overlooked. In the old collections it is poorly represented, having been inserted as *Ph. caesia*.

Distribution in Europe. When collecting data for its distribution in Europe, I failed to find records of the occurrence of *Ph. dubia* in Finland, Ireland, Great Britain, Poland, U. S. S. R., Roumania, Portugal, Spain and Italy. There seems to be no plausible reason, however, why the species should not be found in these countries as well.

Remarks. *Physcia dubia* is a difficult species about which there is still much confusion. Since I long expected closely related *Ph. tribacia* to turn up some time — it was actually discovered only quite recently —, I examined the exsiccata present in the Rijksherbarium in order to find out what exactly the differences between this species and *Ph. dubia* are.

All the material of *tribacia* proves to be strikingly homogeneous, the specimens answering in every respect to the description and photographs given by Lynge in Rabenh., 1935, p. 122. In short, the main characters are: lobes broad, margin crenato-incised, soredia marginal, eventually confluent, lower cortex paraplectenchymatous.

Difficulties arise in the exsiccata of *Ph. dubia*, but if we consider first those numbers cited by Lynge at page 111 (Arnold, Lich. exs., no 429, 745, 787) in addition to the specimens we possess of this author, collected in Novaia Semlja, 13 VII 1921, all of which fully conform to the description of his f. *angusta* (l. c., p. 116), we arrive at the following characters: lobes narrow, margin entire, soralia terminal, labriform and ascending, lower cortex plectenchymatous.

Comparing this diagnosis with that of *tribacia*, it seems incomprehensible that both species could have so often been confused. Yet, this is really the case, and Lynge's statement (l. c., p. 113) already points to the difficulties which may be encountered when trying to identify the species: "... er traut sich nicht, die Arten *Physcia dubia* und *Physcia tribacia* nur habituell zu unterscheiden, wenn es auch in den meisten Fällen mit erheblicher Sicherheit möglich ist".

The lip-shaped soralia at the tips of the side lobes in *dubia* may extend sideways, merging into each other and giving the impression of marginal soralia. Moreover, by the destructive action of the soredial production, the side lobes become gradually shorter and even disappear. The soralia continue their existence as marginal soralia of the main lobes which makes the thallus resemble a specimen of *tribacia*. That is why Lynge refers to the lower cortex as providing the one safe distinguishing mark, being plectenchymatous in *dubia* and paraplectenchymatous in *tribacia* (it is rather confusing that Lynge by his "nicht plektenchymatisch" exactly means plectenchymatous, and by his "plektenchymatisch" paraplectenchymaotous).

Unfortunately, this lower cortex just makes a character of somewhat dubious value, since between the two types there are transitional stages. The hyphae of the exterior zone in the plectenchymatous lower cortex, growing perpendicularly to the surface, may start forming a paraplectenchyma. This is the case in Arnold, Lich. exs., no 787b and Floerke, Deutsche Lich., no 72, and I found the same in specimens of *dubia* collected by myself (no 1980). An even more complete stage in the transition towards a paraplectenchyma has been reached in the lower cortex of the specimens in Havaas. Lich. Norveg., no 110.

However, if we would overlook this initial phase of the formation of paraplectenchyma, in such a case still calling the lower cortex plectenchymatous, which value should then be given to this character? If, for instance, several characters such as broad lobes, crenate margin, marginal soredia speak for *tribacia*, whereas only one, such as the plectenchymatous lower cortex, tells in favour of *dubia*, then, to my mind, the majority of the characters should turn the scale. As examples I may put forward Arnold, Lich. exs., no 272 and 1367, and Arnold, Lich. Monac. exs.. no 326 extant in the Rijksherbarium. Judging from their outward appearance, I feel perfectly unable to separate these plants from the exsiccata of *Ph. tribacia*, and, consequently, I think they belong here indeed. Similar plants seem to have been observed by Lettau (Hedwigia, vol. 60, 1918, p. 100 and 1919, p. 276).

Of course, the splitter, being keen on maintaining small species, may rather prefer to give such plants a different name, and going by the quotation of Lettau (in Hedwigia, vol. 52. 1912, p. 253) these may be called *Ph. dimidiata* (Arn.) Nyl. or, better still, *Ph. caesitia* Nyl., since Lynge has shown *caesitia* and *dimidiata* to be identical, and the former epithet the older (l. c., p. 114).

To what consequences such splitting might lead, may be illustrated by the following example. If in the combination of properties, which characterises *tribacia*, one different factor would justify another species (*caesitia*) to be separated, then the plant differing in a single character from *dubia* ought to be specifically separated in accordance! This would be the case in Kryptog. Vindob. exs., no 2290 which differs from *dubia* in having a paraplectenchymatous lower cortex, and to a somewhat lesser extent in Havaas, Lich. Norveg., no 110, the lower cortex of which still shows signs of a plectenchymatous nature.

The above sufficiently shows that the lower cortex cannot always be relied upon for distinguishing between *dubia* and *tribacia*. On the other hand, I admit that for solving the *dubia-caesitia-tribacia*-problem, one should have the disposal of much more material. I especially regret that up to this time it was impossible to consult Lynge's material of *Ph. dubia* and more particularly his f. *angusta* and f. *lata* (l. c.. p. 116). Another species, too, which circumstances prevented from being sent for comparison is *Ph. vítii* Nádv., published in Stud. Bot. Cechoslov., vol. 8, 1947, p. 94.

As a provisional solution I accept two species, viz. *Ph. dubia* and *Ph. tribacia*, the former being in a narrower sense than conceived by Lynge. I consider his *dubia* and *dubia* f. *angusta* to be identical, whilst his *dubia* f. *lata* (= *Ph. caesitia* auct.) is included in *Ph. tribacia*.

As a rule, *Ph. dubia* is well marked off from species of the *Tenella* group by the absence of marginal cilia. But, owing to certain unknown conditions, there exist forms of *Ph. tenella* which lack cilia. It may be really difficult then to distinguish between both species, particularly if the thalli are strongly sorediate. The lobes of *dubia*, however, are appressed and the colour of the soredia is grey or white. In *tenella* the lobes are more ascending and the soredia are often greenish white.

An interesting specimen was once collected (Heikop, VIII 1830, Van Hall) with narrow (0.3—0.5 mm), discrete, somewhat convex lobes, almost equally broad from centre to circumference. The one secure character I have been able to find, distinguishing this form from (not indigenous) *Ph. teretiuscula*, is in the medullary reaction upon K which is negative in the former and yellow in the latter. The laminal, warty soralia mentioned for *teretiuscula* cannot always serve as a differential character, since they are said sometimes to be lacking (Lynge, l. c., p. 119). This only shows the close affinity of *dubia* and *teretiuscula* (see also Schade in Beih. Bot. Centralbl., vol. 58B, 1938, p. 83). In this connection it is of some interest to note that difficulties have also been encountered in distinguishing *dubia* from *Ph. albinea* (Magnusson in Ark. f. Bot., vol. 33A, 1948, no 16, p. 35), whereas Degelius commented upon the trouble of separating *teretiuscula* and *tribacia*: "Die Grenze gegen *Ph. tribacia* scheint nicht immer scharf zu sein" (in Ark. f. Bot., vol. 25A, 1934. no 1, p. 68).

Specimens examined.

Groningen: Haren, V 1857, *Van Hall,* c. ap. (NBV).

Friesland: Terschelling, Hoorn, 5 IX 1951, *Barkman 2816* (L).

Drente: Bronneger, 6 V 1941, *Maas G. 981b* (L); Drouwenerveld, 6 V 1941, *Maas G. 965* (L); Eext, 3 V 1941, *Maas G. 740a* (L); Lhee, 14 XII 1940, *Maas G. 304b* (L); Valtherveld, 7 V 1941, *Maas G. 1013* (L).

Overijsel: Diepenheim, 20 VII 1941, *Maas G. 1160b* (L).

Gelderland: Groesbeek, 7 III 1941, *Maas G. 494* (L); Renkum, *Buse & Buse-Koppiers* (NBV); Wageningen, *Van Hall,* c. ap. (NBV).

Utrecht: Houten, 21 II 1942, *Stafleu* (U); Leersum, Kolland, 19 IV 1941, *Maas G. 673b, 676* (L).

Noord-Holland: Bennebroek, 28 VI 1942, *Maas G. 1980* (L).

Zuid-Holland: Heikop, VIII 1830, *Van Hall* (L, NBV); Hekendorp, 22 V 1941, *Miss Koster* (L); Leiden, 2 XII 1940, *Maas G. 248* (L); 25 VII 1944, *Maas G. 3030*; 15 VIII *1952, Maas G. 8187* (L); Voorschoten, De Knip, 7 III 1943, *Maas G. 2309b* (L).

Zeeland: Walcheren, Nieuw en St. Joosland, 20 V 1946, 30 VII 1946, *Brakman* (L).

Noord-Brabant: Bergeyk, 25 VII 1942, *Maas G. 2110* (L); Dommelen, 12 VI 1951, *Barkman* (L); Oss, 20 IX 1942, *Maas G. 2231b* (L).

Limburg: Gennep-Afferden, 8 III 1941, *Maas G. 511a* (L).

10. Physcia tribacia (Ach.) Nyl. in Flora. vol. 57, 1874, p. 307; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 122; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 693 (pr. p.) et vol. 10, 1940, p. 656 (ubi lit. et synon.) — *Lecanora tribacia* Ach.. Lich. Un., 1810, p. 415 — *Physcia dubia* f. *lata* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 116.

Exsiccata: Arnold, Lich. exs., no 248, 1152; Claud. et Harm., Lich. Gall. exs., no 318; Fl. exs. Austro-Hung., no 1947; Nádvorník, *Physciac.* exs., no 6; Rabenhorst, Lich. Europ., no 587.

Iconography: Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935. tab. 8, fig. 2—4; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 14, fig. 5.

Macroscopical description — Thallus foliaceous, growing in rosettes, more or less stellate, rather small, 2—3 cm in diam., attached to the substratum by rhizinae, deeply incised. Lobes flaccid and fragile, 3—4 mm long, 0.5—1 mm broad, more or less closely appressed, contiguous to somewhat overlapping, irregularly pinnately branched, plane to somewhat convex, towards the centre split up into numerous, crowded, ascending or imbricate secondary lobules. Margins crenate. Tips fan-like broadened, up to 2 mm broad, crenate to incised, appressed to ascending. Upper side of the lobes pale ash-grey, white pruinose and smooth at the tips, becoming epruinose and wrinkled towards the centre, without *isidia* but *sorediate*. *Soredia* concolorous with the thallus, marginal, somewhat coarse-grained, in places confluent into marginal soralia and in the centre of the thallus also enveloping the tips of the lobules, without, however, forming labriform soralia. Lower side of the thallus white to whitish or somewhat roseate, dull, smooth, plane, with scattered, whitish, simple rhizinae. *Microscopical description* — Upper cortex colourless except for a brownish exterior zone, paraplectenchymatous, 20—40 μ. Gonidia bright green, spherical, (6—)10—16(—19.7) μ, arranged in dense clusters or in a continuous layer of 40—50 μ, closely under the upper cortex, or in places penetrating into it. Medulla colourless, white in reflected light, more or less densely plectenchymatous, 30—70 μ, consisting of leptodermatous hyphae, well marked-off from the lower cortex. Lower cortex colourless, paraplectenchymatous, 20—30 μ. *Apothecia* and *pycnidia* not observed. *Chemical reactions* — Upper cortex K + yellow (atranorine?), Pd + slowly yellowish. Medulla K —, Pd —.

Ecology and distribution in the Netherlands. The specimens described have been found in company of such nitrophilous species as *Physcia adscendens, tenella, orbicularis, grisea* and *Xanthoria parietina*, although a small amount of *Parmelia dubia, sulcata* and *Buellia canescens* was also present. The habitat, on the trunk of an elm along a canal on the outskirts of a small town, moreover suggests that the species is fairly capable of maintaining itself in surroundings obnoxious to most other lichens. Some more finds may be recorded in future, but in all probability they all will come from southern portions of the contry.

Distribution in Europe. The species seems to have its main area in southern Europe, being known from Great Britain, France, Switzerland, southern Germany, Czechoslovakia, Hungary, Portugal, Spain, Italy and Bulgaria.

Remarks. For a discussion of the distinction between *Ph. tribacia* and *dubia*, I may refer to the latter species.

Specimens examined .
Zeeland: Schouwen, Zierikzee, 21 IX 1951, *Barkman 2846* (L).

Subsectio 6. Obscura (Lynge) Maas G. nov. comb.

— *Physcia* subgen. *Brachysperma* sect. *Obscura* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 125; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 650.

Thallus small to medium, 0.5—4 cm in diam., appressed to ascending, grey-brown, dark grey to black-brown (occasionally also very light grey), always epruinose, *sorediate* or *isidiate* or entirely devoid of *soredia* and *isidia*, without marginal cilia. Upper cortex K —. *Apothecia* small, 1—1.5(—2) mm in diam. *Spores* rarely reaching 25 μ.

Key to the species.

1a. Thallus without isidia or soredia . . . . . . **11. Ph. ciliata** (Hoffm.) DR.
1b. Thallus isidiate or sorediate 2

2a. Thallus small, 1 cm in diam. or less, with marginal, warty isidia which may disintegrate and become sorediose . . **13. Ph. nigricans** (Flk.) Stizenb.
2b. Thallus larger, 2—3 cm in diam., with laminal or somewhat marginal maculiform soralia . . . . **12. Ph. orbicularis** (Neck.) Pötsch

11. Physcia ciliata (Hoffm.) DR. in Svensk Bot. Tidskr., vol. 15, 1921, p. 168 et vol. 19, 1925, p. 79; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 126; A. Zahlbr., Cat. Lich. Un.. vol. 10, 1940, p. 651 — *Lichen ciliatus* Hoffm., Enum. Lich., 1784, p. 69 (non vidi) — *Physcia obscura* var. *ciliata* Tuck. in Proc. Americ. Acad. Arts Sci., vol. 4, 1860, p. 398; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 658 (ubi lit. et synon.).

Pro maxima parte sub nomine: *Parmelia obscura*; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 130; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 22.

Exsiccata: Anzi, Lich. rar. Veneti, no 22; Elenkin, Lich. Fl. Ross., no 90a; Erbar. crittog. Ital., ser. 1, no 1163; Funck, Cryptog. Gew. Fichtelgeb., ser. 1, no 498; Hepp, Flecht. Europ., no 596, 597; Kryptog. exs. Vindob., no 577; Leighton, Lich. Brit. exs., no 80; Mougeot et Nestler, Stirp. Cryptog. Vogeso-Rhen., no 448; Rabenhorst, Lich. Europ., no 461, 553, 935; Schaerer, Lich. Helv. exs., no 353, 354; Sommerf., Pl. Cryptog. Norveg., no 68; Stenhammar. Lich. Suec. exs., no 211.

Iconography: Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 4—6, fig. 24—38; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 10, fig. 2; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 16, fig. 7.

Macroscopical description — Thallus foliaceous, growing in rosettes, stellate, medium-sized, 2—3 cm in diam., attached to the substratum by rhizinae, deeply incised. Lobes fairly flexible, long and narrow, about 1 cm long and 0.4—0.8 mm broad, closely appressed, contiguous to overlapping or growing entangled, richly and irregularly pinnately branched, plane or slightly convex, sometimes somewhat corrugated. Margins entire but usually densely setose on account of the numerous, short, black rhizinae projecting sideways. Tips little or not at all broadened, crenate to incised. Upper surface light grey-brown to dark brown, sometimes with a ruddy hue, with or without a narrow darker zone along the margin, dull or slightly shiny, smooth, epruinose, without *isidia* or *soredia*. Lower surface black, dull or somewhat shiny, plane, smooth, with numerous black, rather short, simple or furcate rhizinae which at the tips of the lobes may show white apices. *Microscopical description* — Upper cortex colourless or with a narrow brownish outer zone, paraplectenchymatous, 36—48 μ. Gonidia bright green, spherical, 8—15 μ, arranged in clusters or in a continuous layer of 30—50 μ, closely under the upper cortex or penetrating into it. Medulla colourless, white in reflected light, more or less densely plectenchymatous, particularly densely packed near the lower cortex, 30—70 μ, composed of mesodermatous hyphae. Lower cortex brown-black, paraplectenchymatous, sharply marked off from the medulla, 24—35 μ. *Apothecia* fairly common, sometimes crowded, laminal, sessile, cup-shaped to discoid, 1—2 mm in diam. Amphithecium concolorous with the thallus, dull, smooth, very often with a more or less dense and conspicuous aureole of short, black or white-tipped rhizinae. Margin persistent, entire or slightly crenulate. Disc black-brown, dull or somewhat shiny, epruinose. Epithecium yellow-brown, hypothecium colourless to yellowish, with clusters of gonidia underneath. Hymenium colourless, 80—85 μ. Asci cylindrical-clavate, 15—20 × 60—75 μ, 8-spored. *Spores* mostly shrivelled, dark brown, 2-celled, with strongly thickened cell-walls at the septum and the apices, little or not constricted, ellipsoidal, straight or flattened on one side or somewhat curved, 8—10 × 21—25 μ. Paraphyses simple or furcate, septate, conglutinate, capitato-incrassate at the apices. *Pycnides* laminal, single, visible as black-brown spots or warts, spherical to pyriform, 195—300 μ in diam. Perifulcrium colourless, ostiolum black-brown. *Pycnoconidia* colourless, ellipsoidal, bulging, 1—1.5 × 2—3 μ. *Chemical reactions* — Neither upper cortex, nor medulla react upon the usual tests.

Ecology and distribution in the Netherlands. *Ph. ciliata* is mainly a corticolous species which has been found on *Betula*, *Fagus*, *Fraxinus*, *Populus*, *Salix* and occasionally on lignum. *Salix* proved to be by far the most favoured host. Though the herbarium material shows that the species occurred throughout our country, it was in no way common, and in all probability it is completely lost for the flora now. Most finds are from the period between 1830 and 1850, the latest being from 1881.

Distribution in Europe. As pointed out by Lynge, it is hardly possible to get an idea of the distribution of the species in Europe from the data in earlier litterature, since *ciliata* was rarely properly separated from *orbicularis*. Recent papers on the lichen flora, however, along with the exsiccata mentioned clearly show that *Ph. ciliata*, if far from common, occurs in most European countries.

Remarks. In Medd. Soc. F. Fl. Fenn., vol. 46, 1921, p. 167 Räsänen described *Ph. cycloselis* f. *elongata* Räs. which he later on (in Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo, vol. 12, no 1, 1939, p. 98) changed into *Ph. orbicularis* f. *elongata*. In his original description Räsänen already stated "similis *Ph. ulothrix* f. *ciliatae* (Hoffm.), at th. sorediato." On examining the type specimen, it appears that f. *elongata* in reality is *Ph. ciliata* of which the upper cortex has been affected by insects, the damaged spots very much resembling soralia.

Lynge (l. c., p. 131) definitely showed *Physcia violaria* Erichs. to be *Ph. ciliata* with damaged, soralia-like spots, and he believed the upper cortex tinged yellow by parietin. Lynge came to that assumption on account of the yellow pigment turning purple when touched with K. In his opinion, parietin in certain circumstances would be dissolved in rainwater from nearby *Xanthoria parietina* and subsequently absorbed by the thallus of neighbouring *Ph. ciliata*. To this assumption something may be said, but I may refer to conditions in closely related *Ph. orbicularis* which I know better from own experience. *X. parietina* and *Ph. orbicularis* may be seen growing mixed and entangled without the upper cortex or the soredia of the latter showing any trace of yellow discolouring. Further, no study has been made of the mechanism by which parietin would be dissolved from the thallus of *Xanthoria* and precipitated again in *Ph. orbicularis*. The only thing known is that parietin is hardly soluble in several media except in dilute lye of natron or potassium (Zopf, Flechtenst., 1907, p. 306). Lichens growing on bark are not very likely to come into contact with the latter compounds, since the rain-water which soakes the thalli is of acid reaction. According to the measurements by Duvigneaud, the hydrogen ion concentration of rain-water in several places in Belgium ranges from 3.6—4.9 (in Bull. Soc. Roy. Bot. Belg., vol. 74, 1941—42, p. 33). Moreover, in industrial centra the air is vitiated by impurities which, taken as a whole, will lower the pH of the rain-water. (Full particulars about the importance of the impurities are given by F. W. Clarke, The data of geochemistry, ed. 5, 1924, p. 48 and 54—55. More recent data about air pollution have been published by Leonard, Mc Verry and Crowley in Sci. Proc. Roy. Dublin Soc., N. S., vol. 23, 1942, p. 10—17.) Whether the bark of those trees on which the species is found to grow is of acid or alkaline reaction is insufficienlty known, but some recent investigations in this connection point to a subneutral to acid nature (Klement und Preis, Lichenol. Notiz. in Lotos, vol. 88, (1941—1942) 1943, p. 210; Du Rietz, Om fattigbark- och rikbarksamhällen in Svensk Bot. Tidskr., vol. 39, 1945, p. 147—150). Finally, though there is no proof against the yellow pigment being parietin, it has never to my knowledge been chemically analysed. It has been identified as parietin on account of its colouring purple when treated with K, but this reaction is no decisive feature of parietin alone. It applies to most of the other derivatives of anthracene known in lichens. This means that in the case of *Ph. orbicularis* f. *hueana*, the yellow or orange pigment in the soralia, as well as the "corpuscules écarlates" might prove to be some other lichen acid, viz. the final product of metabolism of the own thallus. In that case, it would be perfectly justified for f. *hueana* to be distinguished from *orbicularis*. It seems different, however, in the case of *Ph. violaria* of which I have seen the type specimen. Here some yellow pigment has apparently been washed over the thallus from another source, leaving a few lobes untouched. These lobes, consequently, do not turn purple with K.

Physcia ciliata seems to be effectively separated from *Ph. orbicularis* by a set of characters: lack of soralia, presence of rhizinae on the lower side of the amphithecium, sometimes even displaying a distinct corona; rhizinae protruding sideways from the lobes; and general habitus. These differences, however, are by no means all established. Lynge (l. c., p. 130) and Schade (in Beih. Bot. Centralbl., vol. 58B, 1938, p. 84) report the sporadical occurrence of amphithecial rhizinae in *orbicularis*, whereas once in a way they may lack in *ciliata* (Lynge in Vid. Selsk. Skr., Mat.-Naturvid. Kl.. vol. 1, 1916, no 8, p. 71). Rhizinae projecting sideways from the lobes may occur in *orbicularis* just as well, whereas again they may lack in *ciliata*. There may arise great difficulties in discriminating both species because they are equally liable to be eaten by insects in nature as well as in the herbarium which, in the case of *ciliata*, easily gives the impression of a thallus with abraded, worn-out soralia. In anatomical respect I fail to see any difference between *ciliata* and *orbicularis*. Also by their habitus it is not always easy to tell both species apart, although generally the lobes in *Ph. ciliata* are more slender and more closely appressed to the substratum, without ascending margins.

Specimens examined.

Groningen: Groningen 14 I 1834, *Van Hall*, c. ap. (L); Harendermolen, *Van Hall* (NBV).

Drente: Eelde, 14 VIII 1855, *Van Hall*, c. ap. (NBV).

Overijsel: Kampen, *Bondam*, identity uncertain (NBV).

Gelderland: Hoog Keppel, 1 IX 1850, *Abeleven* (NBV).

Utrecht: Utrecht, 1841, *Van der Sande Lacoste*, identity uncertain (L); 1843, *Van der Sande Lacoste* (NBV).

Noord-Holland: Bloemendaal, *Buse* (NBV); Diemen, XI 1848, *Van der Sande Lacoste* (NBV); Haarlem, *Buse*, identity uncertain (NBV); *Buse & Gildemeester-Buse*, c. ap. (NBV); *Splitgerber* (L); Overveen, 1841, *Buse & Gildemeester-Buse* (NBV).

Zuid-Holland: 's-Gravenhage, Eik en Duinen, 28 VII 1881, *Abeleven*, c. ap. (NBV); Leiden, I 1830, *Wttewaal*, c. ap. (L); Loosduinen, Ockenburg, 20 VII 1881, *Abeleven*, c. ap. (NBV); 21 VII 1881, *Abeleven*, c. ap., identity uncertain (NBV).

Zeeland: Zuid-Beveland, 1845, *Van den Bosch* (L, NBV); Zuid-Beveland, Goes, V 1843, *Van den Bosch* (NBV); Zuid-Beveland, Zwake, IX 1842, *Van den Bosch*, c. ap. (NBV).

Noord-Brabant: Beek, VIII 1847, *Van den Bosch*, c. ap. (NBV).

12. **Physcia orbicularis** (Neck.) Pötsch in Pötsch et Schiederm., System. Aufzähl. samenlos. Pfl., 1872, p. 247; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 144; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 654 — *Lichen orbicularis* Neck., Meth. Musc., 1771, p. 88 — *Lichen virellus* Ach., Lich. Suec. Prodr., 1798, p. 108 — *Physcia obscura* f. *orbicularis* (Neck.) Th. Fr. in Nov. Act. Reg. Soc. Sci. Upsala, ser. 3, vol. 3, 1861, p. 165; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 655 (ubi lit. et synon.) — *Physcia virella* Flagey in Rev. Mycol., vol. 13, 1891, p. 110; Lynge in Vid. Selsk. Skr., Mat.-Naturvid. Kl., vol. 1. 1916, no 8, p. 72; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 700 (ubi lit. et synon.).

Sub nomine: *Parmelia obscura* et var. *chloantha*, var. *ciliata*, var. *orbicularis*; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 130; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 22—23.

Macroscopical description — Thallus foliaceous, growing in rosettes, stellate or more irregularly spreading with age, small to medium, 1—3 cm in diam., fixed to the substratum by means of rhizinae, deeply incised. Lobes flexible, long and narrow or short and broad, 6—10 mm long, 0.4—1 mm broad, closely appressed to loosely attached, contiguous or overlapping or irregularly growing over each other, richly and irregularly pinnatifid, plane or corrugated or somewhat convex. Margins entire. Tips little or considerably broadened, crenate or incised. Upper side of the lobes white-grey to ash-grey with a brownish or sometimes bluish hue or olive-coloured green-brown to very dark brown, with a tanned or blackish green border at the tips, dull, smooth, without pruina or *isidia*, *sorediate*. *Soralia* maculiform, laminal and scattered over the upper side of the lobes or more or less marginal, sometimes subterminal on the side-lobes, flat or globose, 0.2—1 mm in diam., coarse-grained, originally darker than the thallus, dark brown, blackish green to almost black, more greenish white when worn off, later on more and more confluent and in extreme cases completely covering the centre of the thallus with a sorediate crust. Underside of the lobes black except for a narrow whitish zone at the tips, dull or slightly shiny, smooth, plane, densely covered with black, short, simple or furcate rhizinae. At the tips of the lobes the rhizinae frequently have white apices or they are white altogether; they may protrude much in the way of cilia. *Microscopical description* — Upper cortex colourless or with a narrow brownish exterior zone, paraplectenchymatous, 18—45 μ.

Gonidia bright green, spherical, (7—)9—16 μ, arranged in clusters or in a continuous layer of 30—70 μ, closely under the upper cortex or deeply penetrating into it. Medulla colourless, white in reflected light, more or less densely plectenchymatous, especially densely packed towards the lower cortex, 45—160 μ, consisting of lepto-mesodermatous hyphae. Lower cortex brown-black, paraplectenchymatous, well marked off from the medulla, 22—35 μ. *Apothecia* rather rare, laminal, sometimes crowded, sessile, cup-shaped to discoid, 1—1.5(—2) mm in diam. Amphithecium concolorous with the thallus, dull, smooth. Margin persistent, entire or slightly crenate. Disc darkish red-brown to black, dull or somewhat shiny, without pruina. Epithecium yellow-brown, hypothecium colourless or yellowish, with clusters of gonidia underneath. Hymenium colourless, 75—100 μ. Asci cylindrical-clavate, 14—16 × 60—85 μ, 8-spored. *Spores* olive-brown to dark brown, 2-celled, with strongly thickened cell-walls at the septum and the apices, little or not constricted, ellipsoidal, straight, sometimes flattened on one side, fairly acute at the apices, 8—10 × 20—23 μ. Paraphyses simple or furcate, septate, conglutinate, capitato-incrassate at the apices. *Pycnids* not common, laminal, scattered over the upper surface, single or in small groups, visible as brown-black spots, spherical or pyriform, 190—250 μ in diam. Perifulcrium colourless, ostiolum black-brown, broad. *Pycnoconidia* colourless, ellipsoidal, bulging, 1—1.5 × 2—4 μ. *Chemical reactions* — Upper cortex as well as medulla unaffected by the usual chemicals.

Ecology and distribution in the Netherlands. *Physcia orbicularis* is even more abundant in our country than *Ph. caesia* with which it is frequently found growing mixed. Just like this species, it thrives on trees as well as on stony substrata, being found on *Alnus, Fraxinus, Juglans, Quercus, Sambucus, Tilia,* fruit trees, lignum, granite, sandstone, concrete and tiles. It has a decided preference, however, for *Populus, Salix, Ulmus,* bricks and eternite roofing material, growing in well-exposed places rich in nitrogenous compounds. From this it follows that its habitats may range from trees along roads to brick-built bridges or stone-reinforced dikes of rivers and waterways, and from roofs of isolated farms to those of houses on the outskirts of towns all over the country.

Distribution in Europe. Examination of the litterature cited on p. 280—284 clearly demonstrates that the species abounds throughout Europe.

Remarks. According to Du Rietz (in Svensk Bot. Tidskr., vol. 8, 1914, p. 389) and Lynge (l. c., p. 147), Dalla Torre and Sarnthein would have been the first authors to make the combination *Ph. orbicularis* (Die Flecht. Tirol, 1902, p. 165). As may be gathered, however, from Zahlbruckner (Cat. Lich. Un., vol. 7, 1931, p. 656), this combination had already been made 30 years earlier by Pötsch. The same objections which Lynge raised to the citation of DT. & Sarnth. as the authors who first made the combination, would in his eyes have existed with regard to the citation of Pötsch, since this author also included *Ph. ciliata* in his species. It is incorrect, however, to cite (Neck.) DR. At the most, if the urge is felt to commemorate the fact that Du Rietz was the first to delimit the species properly, one might write (Neck.) Pötsch em. DR.

Variability. Since *Ph. orbicularis* varies a great deal in the size and shape of the lobes as well as in the colour of the thallus, there have been described a number of forms bearing upon these characters. Räsänen e. g. described f. *elongata*, f. *tristis* and f. *pallida*. With regard to f. *elongata* which proves to be *Ph. ciliata*, I may refer to the remarks under that species. f. *pallida* which was described in Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo, vol. 12, 1939, no 1, p. 99, hardly deserves mentioning, since the one character "thallus pallido-griseus" is of doubtful value in a species displaying every shade of grey and brown. The material kindly sent to me by Räsänen convinced me of the absence of any other character which might differentiate f. *pallida* from typical *orbicularis*. Things look different in the case of f. *tristis* which, as I take it, was described in the scheda of Lich. Fenn. exs., 1936, no 244. The material put at my disposal by Räsänen shows a dark-coloured narrow-lobed specimen with black-brown soralia. By its appressed lobes with plane and smooth upper side and by its rhizinae projecting sideways it resembles *Ph. ciliata*. If it could be proved that Necker's *Lichen orbicularis* is a light-coloured specimen, and Necker's quotations suggest so, f. *tristis* would be worth considering.

Concerning the above-mentioned variability of the colour of the upper side of the thallus and the width of the lobes, it should be pointed out that there are two types in this country. One has a pale, mostly greyish, upper side and broad lobes; in the other the upper side is very dark brown to almost blackish, and the lobes are narrow. The peculiar thing is that, whereas both types may be found on stony substrata, the specimens occurring on trees almost exclusively belong to the former type. I have the impression that the morphological difference is mainly due to different insolation. Intermediate stages between both types are numerous, and anatomically there is no difference at all.

Under the specific epithet of *virella* Mereschkovsky describes (in Ann. Conserv. Jard. Bot. Genève, vol. 21, 1919, p. 178—180) several forms, some of the exsiccata of which have come to my hands. f. *nigricascens* (with black soredia) and f. *tenuisecta* (characterised by its lobes being narrower and more finely incised) are minor deviations. var. *gracilis*, however, is a distinct and fine form being characterised by its small and irregular rosettes, by its brownish colour and by its lobes which are closely appressed, somewhat discrete and extremely narrow, being 0.3—0.4(—0.6) mm broad. (Mereschkovsky also described the apothecia, but the words "subtus saepe rhizinis brevibus pallidis ornata" raise some doubts. In fact, the left-hand specimen of the exsiccata preserved in the Botanical Museum and Herbarium at Utrecht clearly proves that specimen to be *Ph. ciliata*). It certainly deserves mentioning, though it should be ranked as a forma rather than as a variety. Similar plants may once in while be found in our country, but at one time they differ from the authentic specimens in their colour being grey instead of brown, and at another the lobes are contiguous or even overlapping, or again they are too robust. So, strictly speaking it would be incorrect to designate such specimens f. *gracilis* (Mereschk.) Maas G. nov. comb., though they may probably be considered transitional stages.

Attention may be drawn to a most peculiar form which I once collected (Vennemeer, between Leiden and Oud-Ade, 1943, no 2752). The specimens have soredial isidia which in some cases completely cover the thallus with a dark brown areolate crust except for a narrow zone along the periphery. Here and there secondary folioles develop among the soredia.

Of *Ph. obscura* Nylander described two varieties which sound somewhat alike, viz. var. *somediosa* (in Bull. Soc. Bot. France, vol. 13, 1866, p. 366) and var. *sorediifera* (in Notis. Sällsk. F. Fl. Fenn. Förh., vol. 11. 1871, p. 180). Judging from the short diagnosis, var. *sorediosa* seems to be *orbicularis* with strongly developed soralia. Var. *sorediifera* which does not seem to have been quoted in any of Nylander's previous papers is a nomen nudum. Fries in his Lichenogr. Scand., vol. 1, 1871, p. 143 commented upon this variety, saying: "a vulgari forma (which is *Ph. obscura* var. *orbicularis*) vix ulla nota differens".

f. **orbicularis.**

Exsiccata: Arnold, Lich. exs., no 880; Arnold, Lich. Monac. exs., no 227, 338 (unrecognisable); Claud. et Harm., Lich. Gall. exs., no 180 (pr. p.), 181, 379, 531; Floerke, Deutsche Lich., no 94; Hepp, Flecht. Europ., no 55 (fragments), 599; Kryptog. exs. Vindob., no 2580; Malbranche, Lich. Normand., no 26 (perhaps *Ph. ciliata*?); Massalongo, Lich. Ital. exs., no 247; Schaerer, Lich. Helv. exs., no 355 (pr. p.), 607, 609 (pr. min. p.).

Iconography: Galløe, Natur. Hist. Danish Lich., vol. 8, 1950. tab. 6—13, fig. 39—40, 42—83; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 10, fig. 1; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 16, fig. 3 (indistinct). 5; Smith et Sowerby, Engl. Bot., vol. 24, 1807, tab. 1696 (not quite certain).

This is the type form of *Ph. orbicularis* the description of which is given above. It differs from the next form in that its soralia are never yellow or orange and remain unaltered when treated with K.

Remarks. From herbarium specimens it appears that apothecia formerly were far more common than in recent times.

In some respects the Dutch material seems different from the description given by Lynge. This author describes the thalli as being small, 1—1.5 cm in diam., whereas the lobes also would be very short, 2—3 mm. Usually I find the plants larger and when growing horizontally on a smooth substratum, their lobes may be traced down to the very centre of the thallus, being at least 1 cm in length. For the rest, from the photograph in Lynge's revision it may be seen that some lobes are at least 6 mm long.

f. **hueana** (Harm.) Erichs. in Verh. Bot. Ver. Prov. Brandenburg. vol. 72, 1930, p. 57; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 147; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 654 — *Physcia obscura* var. *virella* f. *Hueiana* Harm. in Bull. Soc. Sci. Nancy, ser. 2, vol. 31, (1896) 1897, p. 262 — *Physcia virella* f. *Hueana* Lindau, Die Flecht., ed. 2, 1923, p. 234 (non vidi); A Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 702 (ubi lit. et synon.).

Type collection: *Physcia obscura* (Ehrh.) Nyl. var. *virella* (Ach.) Schaer. f. *Hueiana* Harm. in Lab. Bot. Univers. Cathol. Ouest, Angers.

Iconography: Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 7, fig. 41.

Description — Soredia yellow or orange, coloured intensively purple if brought into contact with K. Sometimes the cortex is tinged yellow also. In the gonidial zone in the proximity of the soralia there may be found "corpuscules écarlates" which also turn purple with K.

Remarks. Not uncommon, in the same habitats as f. *orbicularis*. It remains to be seen whether this form should be maintained at all, since it is uncertain yet whether the different colour of the soralia is an innate feature of the own thallus. For a discussion of this problem, I may refer to the remarks under *Ph. ciliata*.

Specimens of *Ph. orbicularis* with yellow soralia have long attracted the attention, and probably Körber was the first to publish a separate name, viz. *Parmelia obscura* (Ehrh.) Kbr. var. *aurella* Kbr. (Parerg. Lich. 1865, p. 36). The type specimen wnich was sent to him from Holland by Van den Bosch who collected it on *Salix* near Breda, is still in Körber's collection in the Rijksherbarium. The epithet *aurella* has no priority over *hueana*, since it was described on the level of a variety, not as forma. It is different in the case of *Ph. ulothrix* var. *virella* f. *flavescens* which was described by Crombie (Monogr. Brit. Lich., vol. 1, 1894, p. 320). Most probably this form is identical with f. *hueana* (which is hardly possible to establish from a photograph only) in which case f. *flavescens* should replace f. *hueana*.

13. Physcia nigricans (Flk.) Stizenb. in Ber. Thätigk. St. Gall. naturw. Ges., (1880—1881) 1882, p. 329 (quoad nomen); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 650 et vol. 10, 1940, p. 654 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9. pars 6/1, 1935, p. 148 — *Lecanora nigricans* Flk. in Sprengel, Neue Entdeck., vol. 2, 1821, p. 97 — *Parmelia obscura* var. *nigricans* Körb., Parerg. Lich., 1865, p. 35; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 23 — *Physcia lithotea* var. *sciastrella* Nyl. in Flora, vol. 60, 1877, p. 354 — *Physcia nigricans* var. *sciastrella* (Nyl.) Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 150; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 654.

Exsiccata: Arnold, Lich. exs., no 583 (fragments); Arnold, Lich. Monac. exs., no 9; Floerke, Deutsche Lich., no 91; Kuták, Lich. Bohem., no 398; Nádvorník, *Physciac.* exs., I, no 4, 7; Reichenb. et Schub., Lich. exs., no 84.

Iconography: Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 1—2, fig. 1—6, 8—17.

Macroscopical description — Thallus foliaceous, growing in rosettes, stellate, very small, 0.5—1 cm in diam., later on uniting with other thalli into larger patches, fixed to the substratum by rhizinae, deeply incised. Lobes flexible, comparatively long and narrow, 2—5 mm long and 0.1—0.5 mm broad, loosely attached or somewhat ascending, contiguous or somewhat discrete or overlapping or growing intertwined, richly and irregularly pinnatifid, plane. Margins entire or irregularly crenate. Tips little or not broadened, crenate to incised. Upper surface of the lobes pale to dark brown, dull, smooth, epruinose, with *soredial isidia* or with true *isidia* which soon turn *sorediose*. *Isidia* marginal and, more especially, apical, extremely small, 30—60 μ broad, roundish, warty to somewhat branched and coralloid, of the same colour as the thallus or darker, very brittle. According to Du Rietz (in Svensk Bot. Tidskr., vol. 19, 1925, p. 70), isidial soralia would develop on the wound where the isidia have broken off, but the isidia may also burst spontaneously, turning sorediose. Lower surface dingy white to pale brownish, dull, smooth, plane, with scattered, short, simple rhizines of the same colour. *Microscopical description* — Upper cortex colourless except for a very narrow brown exterior zone, paraplectenchymatous, 15—45 μ. Gonidia bright green, spherical, 6—12 μ, arranged in clusters or in a continuous layer of 20—30 μ closely under the cortex. Medulla not at all or only slightly developed, 0—20 μ, consisting of a few mesodermatous hyphae. Lower cortex colourless, paraplectenchymatous or inclining to a very dense plectenchyma, clearly marked off from the medulla, sometimes connected to the upper cortex by means of paraplectenchymatous strands, or completely pushing aside the medulla and reaching as far as the gonidial layer. *Apothecia* laminal, sessile, cup-shaped to discoid, 0.5—1 mm in diam. Amphithecium concolorous with the thallus, dull, smooth. Margin persistent, though somewhat receding with age, entire or slightly wrinkled. I once observed small marginal laciniae. Disc black, dull or somewhat shiny, without pruina. Epithecium brown, hypothecium colourless to yellowish, with some clusters of gonidia underneath. Hymenium colourless, 70—75 μ. Asci cylindrical to club-shaped, 15—20 × 55—66 μ, octosporous, with strongly thickened cell-wall at the apex. *Spores* partly shrivelled, dark brown, 2-celled, with strongly thickened cell-walls at the septum and the apices, not constricted in the middle, ellipsoidal, straight or curved, with rounded or slightly acute apices, 7—10 × 17—21 μ. Paraphyses simple or furcate, septate, conglutinate, strongly capitato-incrassate at the tips. *Pycnidia* not observed. *Chemical reactions* — Neither the upper cortex nor the medulla show any reaction upon the usual chemicals.

Ecology and distribution in the Netherlands. In our country the species has been found on *Salix* and *Populus*, as well as on stone. Being rare already in former times, there is only a single recent find, but possibly the species has been overlooked.

Distribution in Europe. It is no easy matter to get a clear idea of the distribution of *Ph. nigricans* in Europe. I suppose, however, it is mainly due to the lack of recent floristic publications that I have no records from Great Britain, Ireland, Poland, Rumania, Greece, Yugoslavia, Italy and Portugal.

Remarks. As in many other *Physciae*, particularly among the dark-coloured species, *Ph. nigricans* has offered considerable difficulties to the early authors which resulted in a great number of names and an equally great confusion. It is again Du Rietz to whom we owe the disentanglement of the mess. This author considered all the names, a bibliography of which is found in his paper mentioned above, synonymous with *nigricans*, but perhaps he went too far in this respect. In Lynge's opinion, the species is to be split up into two varieties, viz. var. *sciastrella* (Nyl.) Lynge and var. *tremulicola* (Nyl.) Lynge. The former is identical with Floerke's

Lecanora nigricans, so it is the typical form and should be called *Physcia nigricans* f. *nigricans*.

Du Rietz writes with good reason (l. c., p. 73) that of all other *Physcia* species *nigricans* is most related to *Ph. sciastra*. Though the latter has not yet been found in Holland, it may still be expected. *Sciastra* is much robuster, with the lobes appressed to slightly ascending and up to 1 mm broad, whereas the lower surface is always black. *Nigricans* is more delicate, being one of the tiniest species. Its lobes are usually 0.2 mm broad, at the utmost reaching a width of 0.5 mm, loosely attached to ascending or almost upright, whilst the underside is dingy white or locally somewhat brownish. Moreover, *sciastra* is mainly saxicolous, occasionally growing upon wood or mosses, whereas *nigricans* is chiefly corticolous.

Variability. As already stated by Du Rietz and Lynge, *Ph. nigricans* is a variable species whose forms gradually merge into each other. It is a matter of taste, of course, whether such forms should be maintained. *Physcia parvula*, for instance, which was described by Vainio (in Medd. Soc. F. Fl. Fenn., vol. 2, 1878, p. 52) as a separate species, but was subsequently reduced to synonymy by Du Rietz and Lynge, is being maintained as f. *parvula* by Nádvorník (in Stud. Bot. Cechoslov., vol. 8, 1947, p. 108). Two more, equally slight, modifications have been described by Harmand (Lich. France, vol. 4. 1909, p. 652), viz. *Ph. sciastrella* f. *pallescens* and f. *nigrescens*, the type-collections of which I have seen. The former is well-developed, with very pale brown, richly sorediate lobes which are up to 4 mm long and 0.5 mm broad. The latter, on the contrary, is very small, with dark fuscous, sparingly isidiate rather than sorediate lobes which are 1—1.5 mm long and 0.1—0.2 mm broad and considerably more branched. On comparison of Harmand's *nigrescens* with specimens of *tremulicola* ex Herb. Oslo, which had been collected by Havaas and Lynge in Hakedalen near Kristiania (Oslo) and to which Lynge later on had added the words f. *atra* n. f., a form which only differs from typical *tremulicola* in its almost black colour, I arrive at the conclusion that *nigrescens* is a mere synonym of *tremulicola*.

Some of the Dutch specimens might be designated as f. *tremulicola* (Nyl.) Maas G. nov. comb., but most belong to f. *nigricans*. None of them belong to f. *pallescens* (Harm.) Lynge.

Nádvorník (l. c., p. 108) considers this f. *pallescens* to be synonymous with his f. *parvula*. Properly speaking this is not correct. From Vainio's description it may be gathered that f. *parvula* has short and dark lobes, whereas those of f. *pallescens* are elongated and pale.

Recently a peculiar form was collected by Barkman between Arcen and Well which differs from other forms known to me in that the colour of the upper side is dark ash-grey.

Specimens examined.

Gelderland: Kesteren, ± 1862, *Sprée* (NBV); Renkum, *Buse*, c. ap. (NBV).

Utrecht: vicinity Utrecht, 1841, *Van der Sande Lacoste* (L).

Noord-Brabant: 's-Hertogenbosch-Vught, 8 X 1904, *Wakker* (f. *tremulicola*) (L); Orthen-Hedel, 8 IV 1905, *Wakker*, c. ap. (L); Weil-Gestel, 26 XII 1904, *Wakker* (L).

Limburg: Arcen-Well, "De Hamert", 15 VI 1951, *Barkman* (L).

Subsectio 7. Pulverulenta (Lynge) Maas G. nov. comb.

— *Physcia* subgen. *Brachysperma* sect. *Pulverulenta* Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 152; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 650.

Thallus medium to large, 5—10 cm in diam., loosely attached or with somewhat ascending lobes, light grey, grey-brown, grey-green or dark brown, more or less pruinose, without marginal cilia, *sorediate* or *esorediate*, rarely *isidiate*. Upper cortex K —. *Apothecia*, for all is known, large, 2—4(—5) mm in diam. *Spores* large, over 25 μ long.

Key to the species.

1a. Thallus esorediate . . . . **14. Ph. pulverulenta** (Schreb.) Hampe
1b. Thallus sorediate, sometimes with soredial isidia
15. Ph. grisea (Lam.) A. Zahlbr.

14. Physcia pulverulenta (Schreb.) Hampe in Fürnr., Naturh. Topogr. Regensburg, vol. 2, 1839, p. 249 (quoad nomen); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 668 et vol. 10, 1940, p. 654 (ubi lit et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl.. ed. 2, vol. 9, pars 6/1, 1935, p. 153 — *Lichen pulverulentus* Schreb., Spicil. Fl. Lips., 1771, p. 128 (non vidi) — *Parmelia pulverulenta* Ach., Meth. Lich., 1803, p. 210; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 128; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2. 1898, p. 21.

Macroscopical description — Thallus foliaceous, more or less distinctly growing in rosettes and stellate, medium to large, 4—15 cm in diam., fixed to the substratum by means of rhizinae, deeply incised. Lobes very rigid, rather long and narrow, 0.5—1.5 cm long and 0.5—1.5 mm broad, appressed to loosely attached, contiguous or overlapping, sometimes discrete or growing entangled, richly and irregularly pinnately branched, plane, corrugated or lengthways wrinkled, more rarely warty to strongly papillate. Margins plane or ascending, entire or slightly crenate or lobate, sometimes with secondary laciniae which may cover nearly the whole of the thallus. Tips somewhat broadened, incised. Upper side of the lobes grey-brown to chestnut, dull, in some cases epruinose, but mostly granulato-pruinose, smooth or irregularly indented, without *isidia* or *soredia*. Pruina whitish or bluish, confined to the tips of the lobes or sometimes completely covering the whole of the thallus. Lower side of the lobes for the greater part black, pale brown to white at the tips, dull or somewhat shiny, smooth, rhizinose. Rhizinae at the margins of the lobes crowded, black or pale, short, toward the middle of the thallus always black, frequently strongly branched and developing into a dense felty layer. *Microscopical description* — Upper cortex colourless with a colourless or yellowish amorphous outer zone, very densely plectenchymatous merging into paraplectenchyma, 30—75(—90) μ. Gonidia bright green, spherical, 7—18 μ, arranged in clusters or in a continuous layer of 60—90 μ, closely under the upper cortex and partly penetrating into it. Medulla colourless, white in reflected light, rather densely plectenchymatous, especially toward the lower cortex and gradually passing into it, 70—180 μ, consisting of leptodermatous hyphae. Lower cortex black except near the tips of the lobes, very densely plectenchymatous, gradually passing into paraplectenchyma, 20—30 μ. One might also say that the lower cortex is composed of a black outer zone and a colourless inner one transitionary into the medullary layer. *Apothecia* rather common and frequently crowded, laminal, sessile, cup-shaped to discoid, 1—3(—5) mm in diam. Amphithecium of the same colour as the thallus, becoming darker to black towards the base, dull, smooth or slightly rugged. Margin persistent, pruinose or epruinose, smooth, later on frequently warted to strongly crenate, in some cases with secondary laciniae. Disc dark brown to black, dull, naked or in the same plant light caesio-pruinose. Epithecium brownish, hypothecium colourless to yellowish with clusters of gonidia underneath. Hymenium colourless, 165—200(—230) μ. Asci cylindrical-clavate, 21—30 × 108—120 μ, 8-spored. *Spores* black-green to dark brown-green, 2-celled, with strongly thickened cell-walls at the septum and the apices, constricted in the middle, broadly ellipsoidal, straight or curved and fabiform, with rounded apices, 14—18 × 27—39 μ. Paraphyses septate, scarcely conglutinate, with furcate to branched, somewhat incrassate tips. *Pycnidia* not common, laminal, immersed at the tips of the lobes, visible as brown spots or warts, single or in small groups, spherical or pyriform, 120—200 × 200—250 μ. Perifulcrium colourless, ostiolum brown. *Pycnoconidia* colourless, cylindrical, straight, ± 1 × 3.5—4.5 μ. *Chemical reactions* — Upper cortex and medulla indifferent to the usual reagentia.

Ecology and distribution in the Netherlands. *Physcia pulverulenta* in this country is a corticolous species, *Ulmus* being the most favoured tree for a host. Next come *Populus* and *Salix*, whereas the species may also be found on dust-encrusted trunks of such trees as *Fagus*, *Quercus* or *Juglans*. Yet, it seems to be far less kopronitrophilous than e. g. *Ph. grisea* which may account for its rarity in the vicinity of towns. In former times *Ph. pulverulenta* used to be a common species throughout the country, occurring in beautiful specimens, but in recent times it has lost ground and is not too common, probably even being rare in southern and eastern provinces. Specimens exceeding 10 cm in diam. have never been found any more and the variability of the species also seems to be less.

Distribution in Europe. Reported to occur throughout Europe.

Remarks. According to Lynge, a delimitation of the species answering our modern views was for the first time proposed by Sandstede (in Abh. naturw. Ver. Bremen, vol. 21, 1912, p. 236), and wishing to express this state of things Lynge therefore writes *Ph. pulverulenta* (Schreb.) Sandst. This is incorrect, for however Hampe's conception of *pulverulenta* may have diverged from ours, Hampe was the first to make the new combination.

From the labels in the early herbaria it appears that pale specimens of *Ph. pulverulenta* have frequently been mistaken for *aipolia*. The latter, however, has whitish pseudocyphellae which show more distinctly when moistened. *Ph. pulverulenta* lacks these white spots, its underside is black but for the margin, the upper surface becomes apple-green when moistened. In *aipolia* the lower surface is white, whereas the upper surface turns grey-green when wetted. Moreover, the upper cortex and medulla of *aipolia* stain yellow with K, whereas in *pulverulenta* they remain unaltered. Finally, in *aipolia* the spores are always much narrower.

Dark and completely epruinose forms of *pulverulenta* might be mistaken for esorediate species of the *Obscura* subsection. Of these, however, *ciliata* is the only species which for this country needs to be taken into account, and from it *pulverulenta* may be told at once by the lack of rhizinae at the apothecial margin, the coarser thallus which is more loosely attached, the larger spores, and by several more anatomical features.

Variability. *Ph. pulverulenta* is one of the few species of the genus of which a great many varieties and forms have been described. Only a few will be discussed here in so far as they concern the native lichen flora.

Taking for convenience's sake the typical form as the centre of the species, which is only a historical arrangement, around this f. *pulverulenta* there have been grouped other forms which differ in various ways. The lobes may be stellate and very narrow (f. *angustata*), or densely pruinose (f. *argyphaea*), or epruinose (f. *nuda* and closely related forms), or covered with papillae (f. *subpapillosa*), or the central lobes may be very small, inflated and imbricate (f. *turgida*), or the apothecial margin may be set with a crown of secondary laciniae (f. *venusta*). It goes without saying that in so polymorphous a species the forms (and not only those mentioned here) do not represent well-delimited taxa. On the contrary, intergradations are numerous, and this is what necessitates a more detailed discussion especially of the epruinose forms.

A form strikingly differing from f. *pulverulenta* was described as f. *nuda* by Harmand in 1909. It is characterised by its brown, epruinose lobes, but on account of the few secondary lobules at the apothecial margin it is intermediate between f. *pulverulenta* and var. *subvenusta* which will be discussed later on.

Little different from f. *nuda* is var. *rufescens* Mereschk. (in Hedwigia, vol. 61, 1919, p. 231) with brown, epruinose lobes, but no secondary lobules at the apothecial margin. The difference is the less significant, since from the same locality Mereschkovsky had specimens about which he was in doubt whether or not to call them f. *atrynea* on account of the presence of some marginal laciniae on the apothecia. That the apothecial disc is entirely black in f. *atrynea* and more or less pruinose in var. *rufescens* is an immaterial difference, since naked and pruinose apothecia are known to occur in the same specimen in several other forms of *Ph. pulverulenta*.

Another brown, epruinose form is f. *fusca* Bouly de Lesd. (Rech. Lich. Dunkerque, 1910, p. 104) of which it is hard to ascertain whether it is identical with or different from f. *nuda*. Bouly de Lesdain (in litt. 1 II 1951) informed me that he had no recollection of the general appearance of his form, whereas the material had gone lost.

Körber in his Syst. Lich. Germ., 1855, p. 87 mentions a *Parmelia pulverulenta* var. *vulgaris* f. *polita* Fw., of which no evidence can be obtained whether Von Flotow supplied the name only or the description as well. It agrees with f. *nuda* in having the lobes epruinose but nothing is said of the colour of the thallus. There is no material extant in Körber's collection.

Of the forms mentioned I am inclined to retain f. *nuda,* discarding *rufescens, atrynea, fusca* and *polita* as being either uncertain forms or trivial modifications of *nuda.*

Sometimes epruinose specimens are met with which, on account of their grey colour, cannot be considered to belong to f. *nuda.* They are best regarded as epruinose modifications of f. *pulverulenta.*

In Hedwigia, vol. 61, 1919, p. 230 Mereschkovsky described a f. *nuda,* designating an epruinose modification of var. *angustata.* The epithet is illegitimate, since it is a later homonym of Harmand's *nuda.*

Another form which will be disregarded in the present paper is *Physcia pulverulenta* var. *subvenusta* Nyl. (in Bull. Soc. Linn. Normand., ser. 2, vol. 6, 1872, p. 285). Though I have not been able to locate the type specimen (neither in Helsinki, nor in London, Paris or Rennes), I have seen some specimens ex herb. Nylander. no 32286, from Helsinki. They fully correspond to Nylander's short diagnosis. Since *subvenusta* is perfectly intermediate between *pulverulenta* (with little or non-coronate apothecia) and *venusta* (with richly proliferous apothecial margins), and no sharp line can be drawn on either side, I consider a separate form superfluous.

It is a well-kown phenomenon among *Physciae* that the apothecial margin, when growing older, tends to become increasingly crenate. This development may be traced in the same plant going from the circumference to the centre. I presume that Mereschkovsky in describing his f. *rugosa* (in Hedwigia, vol. 61, 1919, p. 229) just meant a very old stage in which the apothecia all have a crenate margin.

Key to the forms.

1a. Nearly the whole of the thallus warty or covered with papillae f. **subpapillosa** (Cromb.) Erichs.

1b. Thallus different 2

2a. Centre of the thallus consisting of crowded, imbricate, inflated, small laciniae f. **turgida** (Schaer.) Oliv.

2b. Thallus different, at the most with a few secondary laciniae or papillae scattered along the margins 3

3a. Thallus more or less pruinose 4

4a. Pruina occurring at the tips of the lobes, or occasionally extending somewhat further towards the centre 5

5a. Lobes contiguous, broadened at the tips 6

6a. Apothecial margin set with a crown of secondary lobules f. **venusta** (Ach.) Sandst.

6b. Apothecia non-coronate, or rarely with some laciniae f. **pulverulenta**

5b. Lobes very narrow, discrete, not broadened at the tips; in between the lobes a dense black felt . f. **angustata** (Hoffm.) Leight.

4b. Thallus completely covered with a thick pruina f. **argyphaea** (Ach.) Oliv.

3b. Thallus epruinose 7

7a. Thallus grey or grey-brown epruinose modification of f. **pulverulenta**

7b. Thallus brown . . . . f. **nuda** Harm. or epruinose modification of f. **angustata** (Hoffm.) Leight.

f. **pulverulenta** — *Lichen allochrous* Ehrh., Lich. exs., no 187 (Genève) — *Parmelia pulverulenta* var. *allochroa* Schaer., Lich. Helv. Spicil., sect. 9, 1840, p. 445; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 128; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 22 — *Physcia pulverulenta* var. *allochroa* Th. Fr., Lich. Scand., vol. 1, 1871, p. 136; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 674 et vol. 10, 1940, p. 655 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 157.

Type collection: *Lichen pulverulentus* Schreb. in Botanische Staatssammlung, München.

Exsiccata: Claud. et Harm., Lich. Gall. exs., no 492; Desmazières, Pl. Cryptog. Nord France, no 144; Floerke, Deutsche Lich., no 172; Funck, Cryptog. Gew. Fichtelgeb., no 100, 597; idem, ed. 2, no 110; Hepp, Flecht. Europ., no 874 (pr. p.); Leighton, Lich. Brit. exs., no 49 (pr. min. p.); Rabenhorst, Lich. Europ., no 96, 187 (pr. min. p.); Schaerer, Lich. Helv. exs., no 356 (pr. p.); Stenhammar, Lich. Suec. exs., no 72 (pr. p.).

Iconography: Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tab. 29, fig. 10 (not typical); Cretzoiu in Inst. Cercetar. Experim. Forest., ser. 2, vol. 47, 1941, tab. 20, fig. 1; Galløe. Natur. Hist. Danish Lich., vol. 8, 1950, tab. 40—44, fig. 251—253, 256, 258—269; Migula, Kryptog.-Fl. Deutschl., vol. 4, pars 1, 1929, tab. 2, fig. 6.

Description — Lobes contiguous or overlapping, upper side grey-brown, more or less pruinose, secondary lobules few or none. Apothecial margin without secondary laciniae or a few apothecia bearing some lobules.

Remarks. I examined Schreber's material which, apart from a few bits along with one specimen of *Ph. grisea*, contains 4 well-preserved specimens, all of which are fertile. Very few apothecia show secondary laciniae projecting from the amphithecium, sometimes only 1, in other cases 2 or 3. In most cases the margin is smooth, only in 1 specimen which has crowded apothecia it is crenulate.

It may be of interest to note that the majority of the indigenous specimens examined belong to f. *pulverulenta*. Some are intermediate between this and any of the other forms, whilst there are quite a few of the "*subvenusta*" type. Some epruinose specimens which I had formerly labelled f. *polita* Flot. in the herbarium, may be better considered epruinose modifications of f. *pulverulenta* since *polita* is a dubious form of which there is no authentic material left.

f. **argyphaea** (Ach.) Oliv. in Rev. Bot., vol. 12, 1894, p. 84 — *Parmelia pulverulenta* var. *argyphaea* Ach., Lich. Un., 1810, p. 474 — *Physcia pulverulenta* var. *argyphaea* (Ach.) Nyl. in Not. F. Fl. Fenn. Förh., N. S., vol. 2, 1861, p. 109; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 677 et vol. 10, 1940, p. 655; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 158.

Exsiccatum: Kryptog. exs. Vindob., no 2367.

Iconography: Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tab. 30, fig. 6; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 11, fig. 3; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 14. fig. 7.

Description — Lobes broad, contiguous or overlapping, broadened at the tips, wholly covered with a thick, white or sometimes bluish pruina. *Apothecia* albo-pruinose as well, and with a light caesio-pruinose disc.

Remarks. Most specimens are transitional stages to f. *pulverulenta*, rather than true *argyphaea*.

f. **angustata** (Hoffm.) Leight., Lich. Fl. Great Brit., 1871, p. 147 — *Lichen angustatus* Hoffm., Enum. Lich., 1784, p. 77 (non vidi) — *Parmelia pulverulenta* var. *angustata* Ach., Lich. Un.. 1810, p. 474; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 22 — *Physcia pulverulenta* var. *angustata* Nyl. in Bot. Notis., 1853, p. 155; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 675 et vol. 10, 1940, p. 655; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 159.

Exsiccatum: Cretzoiu, Lich. Roman. exs., no 70 (not very typical).

Iconography: Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 14, fig. 1.

Description — Lobes narrow, 0.5—1 mm broad, not broadened at the tips, stellate, richly and pinnately branched, discrete, grey-brown to chestnut or dark brown, naked except for the whitish pruinose tips. Sometimes even the tips may be epruinose. In between the lobes the rhizinae form a conspicuous and often bulging, black, felty mass.

Remarks. The form has not been found any more in recent times.

f. **nuda** Harm., Lich. France, vol. 4, 1909, p. 634; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 673 (ubi lit.).

Type collection: *Physcia pulverulenta* f. *nuda* Harm. in Lab. Bot. Univers. Cathol. Ouest, Angers.

Description — Upper side red-brown to dark brown, epruinose. *Apothecia* with a few secondary laciniae at the margin. Disc naked or pruinose.

Remarks. The form may still be found in this country, but it has become rare. Stages intermediate between this and other forms, especially the "*subvenusta*" type, have been recorded.

f. **venusta** (Ach.) Sandst. in Abh. Naturw. Ver. Bremen, vol. 21, 1912, p. 237 — *Parmelia venusta* Ach., Meth. Lich., 1803, p. 211 — *Physcia pulverulenta* subsp. *venusta* Nyl., Syn. Lich., vol. 1, 1858—1860, p. 421; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 697 (pro spec., ubi lit. et synon.) — *Parmelia pulverulenta* var. *venusta* Genth, Cryptog.-Fl. Herzogth. Nassau, 1836, p. 345 (non vidi); Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 22 — *Physcia pulverulenta* var. *venusta*; Nyl. in Act. Soc. Linn. Bordeaux, vol. 21, 1856, p. 308; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 159; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 655.

Exsiccata: Claud. et Harm., Lich. Gall. exs., no 178 (not typical), 493; Marcucci, Un. Itin. Cryptog., 1866. no 17.

Iconography: Ach., Meth. Lich., 1803, tab. 8, fig. 5; Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 42, fig. 257; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 11. fig. 1; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 15, fig. 4; Smith et Sowerby, Engl. Bot., vol. 29, 1809, tabl. 2063.

Description — Lobes grey-brown to brown, little pruinose, more or less imbricately overlapping. In the centre the thallus tends to be covered with numerous secondary laciniae. Apothecial margin surrounded by a dense corona of simple, incised or furcate lobules. Disc caesio-pruinose.

Remarks. This form, already being rare in the former century, has never been found in recent times. According to Lynge, it comes to a richer development in southern portions of Europe where it is more abundant.

f. **subpapillosa** (Cromb.) Erichs. in Verh. Bot. Ver. Prov. Brandenburg, vol. 72, 1930, p. 59 (pro var. *turgidae* forma); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 673 (ubi lit.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 158 — *Physcia pulverulenta* var. *subpapillosa* Cromb. in J. of Bot., vol. 20, 1882, p. 273.

Iconography: Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 41—42, fig. 254—255.

Description — Almost the whole of the upper side warty or covered with papillae, more or less pruinose.

Remarks. In the original diagnosis by Crombie nothing was said about the pruina. In the description given later on in his Brit. Lich., vol. 1, 1894, p. 308 — a book I did not see myself, but the crucial passage of which was quoted by Mereschkovsky in Hedwigia, vol. 61, 1919, p. 228 — it runs: "Th. greyish-white, pruinose, ..."

The present form is not uncommon in this country.

Sometimes it may be difficult to know whether a specimen has to be placed under f. *subpapillosa* or under f. *turgida*, and in the same way stages intermediate between *subpapillosa* and *pulverulenta* are by no means rare.

f. **turgida** (Schaer.) Oliv. in Mém. Soc. Nation. Sci. Natur. Cherbourg, vol. 36, 1906—1907, p. 236; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 674 (ubi lit. et synon.) — *Parmelia pulverulenta* var. *turgida* Schaer., Enum. Crit. Lich. Europ., 1850, p. 38 — *Physcia pulverulenta* var. *turgida* Mong. in Bull. Acad. Internat. Géogr. Bot., vol. 16, 1906, p. 160; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 158; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 655.

Type collection: *Parmelia pulverulenta* var. *turgida* Schaer. in Herb. Schaer., Genève.

Iconography: Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 11, fig. 4; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 14, fig. 3.

Description — Upper surface of the thallus brown, epruinose or with a faint pruina. Central lobes very small, more or less inflated, crowded, imbricately overlapping. Peripheral lobes as in f. *pulverulenta*.

Remarks. Not uncommon in this country.

As stated above, there is a close relationship between *turgida* and *subpapillosa*. Some authors (Erichsen in Verh. Bot. Ver. Prov. Brandenburg, vol. 72, 1930, p. 58—59; Lynge, l. c., p. 158) wish to express this relation by raising *turgida* to varietal rank and subordinating *subpapillosa* to it as a forma. Besides, another form is added, viz. f. *panniformis* Cromb. which will be discussed below.

Lynge deviates from the original diagnosis in allowing the thallus of *turgida* to be "wenig bis sehr wenig bereift". Actually, some of the lobes in Schaerer's type specimens ("ad arbores circa Bernam") which I have examined show a very faint pruina. Other specimens, however, which I also received from Schaerer's herbarium, collected by Philippe in the Pyrenees, are devoid of the slightest trace of a pruina. These specimens differ from Schaerer's description in that the central lobes are not turgid at all. But in this respect, the type collection itself is not homogeneous. The left-side specimen very well fits the description which Schaerer wrote on his label "... foliol. centralib. congestis breviss. imbricatis erectiusculis (pulposis) periphericis discretis laciniatis depressis". The specimen in the middle, however, has a few panniform, appressed, not pulpose secondary lobules which do not look as if combed into one direction. In conforms to the collection from the Pyrenees and likewise resembles the type collection of f. *panniformis* Crombie of which I received a photograph from the British Museum, Natural History, London. (Crombie published his form in J. of Bot., vol. 20, 1882, p. 273; his *panniformis* in J. Linn. Soc. Bot., vol. 17, 1880, p. 571 is a nomen nudum.) I am inclined to think, as Schaerer might have done, that *turgida* should be allowed a variability somewhat wider than the description properly speaking requires, although others may maintain that *panniformis* cannot be considered synonymous with *turgida*.

var. *imbricata* B. de Lesd., of which I have seen no other description than that quoted by Mereschkovsky in Hedwigia, vol. 61, 1919, p. 231, only seems to differ from *turgida* in having poorly developed peripheral lobes.

15. Physcia grisea (Lam.) A. Zahlbr. in Ann. Naturhist. Hofmus. Wien, vol. 26, 1912, p. 177; Cat. Lich. Un., vol. 7, 1931, p. 619; vol. 8, 1932, p. 596 et vol. 10, 1940, p. 653 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 167 — *Lichen griseus* Lam., Encycl. Meth. Bot., vol. 3, 1789, p. 480 — *Physcia pulverulenta* var. *grisea* Kickx, Fl. Cryptog. Flandres, vol. 1, 1867, p. 225; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 129; Abelev. in Prodr. Fl. Batav.. ed. 2, vol. 2, pars 2, 1898, p. 22.

Macroscopical description — Thallus foliaceous, growing in rosettes or irregularly spreading, distinctly stellate when young, less so with age, medium-sized to large, 3—8 cm in diam., attached to the substratum by rhizinae, deeply incised. Lobes flexible, long and narrow, hardly to be traced down to the centre, at least 1 cm long, 0.5—1.5 mm broad, appressed to loosely attached, contiguous or overlapping at the margins, growing entangled in the centre of the thallus, richly and irregularly pinnatifid, plane at the tips but soon becoming concave owing to the ascending margins, or corrugated or lengthways folded. Margins more or less ascending, slightly crenulate or lobate or incised. Tips broadened to 2—3 mm, lobate or incised. Upper surface usually light grey-brown, not infrequently also grey-green, pale grey or chestnut to dark brown, sometimes with tanned tips, dull, smooth or wrinkly-rugged, pruinose or more rarely epruinose, *sorediate*. Pruina white or bluish white, granular, usually occurring at the tips of the lobes, but often extending over a lesser or greater part of the surface or completely covering the lobes. *Soralia* for the greater part marginal, occasionally also laminal, of the same colour as the thallus or lighter or darker, coarse-grained, towards the centre of the thallus tending to spread more and more over the surface of the lobes, growing into larger lumps and occasionally turning into an extensive soredial mass, sometimes gradually passing into *soredial isidia.* True *isidia* may also occur. Lower side of the lobes white to brownish and dull, or black for the greater part and more or less shiny, smooth or indented, more or less covered with rhizinae. Rhizinae white, black-tipped or black, short, simple or fibrillose and branched, in some cases covering the whole underside with a black felty layer. *Microscopical description* — Upper cortex colourless or with a yellowish exterior zone above which there is an amorphous layer, paraplectenchymatous, 30—60 μ. Gonidia bright green, spherical 10—14(—16) μ, arranged in clusters or in a continuous layer of 25—66 μ, closely under the upper cortex and partly penetrating into it. Medulla colourless and white in reflected light, or yellowish, densely plectenchymatous, 75—200 μ, consisting of meso-to leptodermatous hyphae. Lower cortex colourless to yellowish, either hardly developed, only consisting of medullary hyphae being put more closely together and, moreover, having the cell-walls thickened, or in other places well-developed and more or less paraplectenchymatous, up to 40 μ thick, gradually passing into the medulla. At the base of the rhizinae at any rate, the lower cortex is always extant, being either very densely plectenchymatous or paraplectenchymatous or any intermediate stage. *Apothecia* very rare, single, laminal, sessile or shortly pedicellate, cup-shaped to discoid, 1—1.5 mm in diam. Amphithecium of the same colour as the thallus, dull, smooth or ribbed, pruinose, sometimes becoming sorediose. Margin persistent, crenate or servediate. Disc brown-black, dull, naked or strongly caesio-pruinose. Epithecium brown, hypothecium colourless to brownish, with clusters of gonidia underneath. Hymenium colourless, about 120 μ. Asci cylindrical-clavate, 27—30 × 78—105 μ, 4(?)-spored. *Spores* brown-black, 2-celled, with strongly thickened cell-walls at the septum and the apices, constricted in the middle, ellipsoidal, straight or fabiform, 13—17 × 24—33 μ. Paraphyses simple or furcate, septate, conglutinate, not incrassate at the apices. *Pycnidia* laminal, extremely difficult to discern, probably very soon destroyed by the soredia, visible as brown-black spots, single or in groups of 3—4, pyriform, 120—150 × 150—200 μ. Perifulcrium colourless, ostiolum for the greater part colourless, with a narrow brown exterior zone. *Pycnoconidia* colourless, cylindrical, straight or slightly curved, ± 1 × 3.5—5 μ. *Chemical reactions* — None of the usual chemicals cause any reaction.

Ecology and distribution in the Netherlands. In this country *Ph. grisea* may be found on trees and almost equally often on concrete and bricks of bridges and old walls. The species has been collected on fruit trees, *Fraxinus, Juglans, Populus, Quercus, Salix* and, most of all, on *Ulmus.* It is a (kopro)nitrophilous and very common species which is even found to thrive in the midst of smaller towns.

Distribution in Europe. Common throughout Europe.

Variability. As in the preceding species, *Ph. grisea* gives some trouble on account of the numerous forms described, some of which need to be discussed in detail.

A problem which with time does not seem to have grown less is the question *grisea—leucoleiptes*. The colour of the underside used to be looked upon as an important character by which both groups could be distinguished. A white lower surface was considered characteristic of *Ph. grisea* and allied forms, a black one of *Ph. leucoleiptes*.

Leucoleiptes was originally described by Tuckerman as a variety of *Parmelia pulverulenta*, and in this respect he was followed, amongst others, by Hue (in Nouv. Arch. Mus., ser. 4, vol. 2, 1900, p. 68) and by Harmand (Lich. France, vol. 4, 1909, p. 635). It is true that both *pulverulenta* and *leucoleiptes* show a black underside which formerly was apparently considered of greater importance than the presence or absence of soredia.

Lettau was the first to realise the value of the soredia, segregating *leucoleiptes* as a species of its own (in Hedwigia, vol. 52, 1912, p. 254). Afterwards it was the merit of Lynge (in Vid. Selsk. Skr., Mat.-Naturvid. Kl., vol. 1, 1916, no 8, p. 66—67) to have lumped all esorediate forms under *Ph. pulverulenta* and all sorediate ones under *Ph. grisea*. Later on, too, Lynge kept to his view that the colour of the lower side is inappropriate as a specific distinguishing character (in Rabenh., p. 172, 174).

Erichsen (in Verh. Bot. Ver. Prov. Brandenburg, vol. 72, 1930, p. 54), however, observed: "Typische *leucoleiptes* ... verdient durchaus, wenn auch nicht als Art, so doch als Varietät abgetrennt zu werden, auch wenn sich Uebergänge zu anderen Formen nachweisen lassen. Solche kommen auch zwischen den von Lynge aufgestellten Formen übergenug vor". But Erichsen did not know himself how to deal properly with the difficulties, and eventually subdivided *grisea* into two main groups "ohne Rücksicht auf die Färbung der Unterseite", ignoring the fact that it was exactly the colour of the lower side which had mattered.

In recent times the colour of the underside has again been considered a factor of taxonomical importance by Nádvorník (in Stud. Bot. Cechoslov., vol. 8, 1947, p. 69—124) who introduced two more characters, viz. the structure of the lower surface and the general appearance of the rhizinae.

First the colour of both rhizinae and underside will be discussed jointly. As pointed out by Nádvorník, the difference between *Ph. grisea* and *Ph. leucoleiptes* would, among others, lie in the entirely pale lower side and pale rhizinae of the former species, and the "sombre" lower side and black rhizinae of the latter. As regards the colour of the rhizinae in *grisea*, I have studied specimens distributed by Nádvorník under the name of *Physcia grisea* f. *albida* Nádv. in his *Physciac.* exs., no 1 and found the rhizinae to be white or black-tipped or black. Generally, beside black rhizinae inserted in a pale lower side, it is no trouble at all in specimens of the *grisea*-group to find examples in which the black colour seems to have spread from the base of the rhizinae onto the surrounding surface so as to form a dark blotch. The further down to the centre of the thallus, the better the chance of finding such spots. To take one example only, I may refer to *Physcia grisea* in Nádvorník, *Physciac.* exs., no 19. The above observation is not new, it has already been made by Lynge who over and over again commented upon it (e. g. 1916, p. 67). This observation leads us to the value of the colour of the underside as a distinguishing character. In Kryptog. exs. Vindob., no 2780 (which

Lynge considered typical f. *pityrea*) I found the lower surface to be entirely pale, while in no 1980 (*Ph. grisea*) it is brownish with scattered dark patches. Claud. et Harm., Lich. Gall. exs., no 494 (f. *brunnea* Harm., though rather thought to be f. *semifarrea* by Lynge, 1916, p. 67), extant in this institute, shows the underside white from the tips of the lobes to halfway down the centre, and black for the remainder. A similar colour pattern is found in our specimen of Rabenhorst, Lich. Europ. exs., no 909 which Vainio considered to correspond with his f. *subnitens* (in Medd. Soc. F. Fl. Fenn., vol. 6, 1881, p. 132). On examining Vainio's type specimens, however, I found the lower side to be black except for a whitish zone at the tips of the lobes. It should be noted that Nádvorník counts *subnitens* a variety of *Ph. grisea* which should have a pale underside. A black lower surface with only a pale zone at the tips of the lobes is furthermore found in Claud. et Harm., no 495 which, according to Lynge (1916, p. 63), is *Ph. grisea* f. *alphiphora*, but should be placed under *Ph. leucoleiptes* according to Nádvorník (1947, p. 121). Another transitional stage is seen in the description of Malme's specimens of f. *alphiphora* about which Lynge (1935, p. 173) writes: "hat im groszen und ganzen eine schwarze Unterseite, aber zwischen den Rhizinen sieht man stellenweise hellere bis ungefärbte Partien ..." A very illustrative example of the unsuitability of the colour of the lower surface as a specific character is given by Nádvorník in his *Ph. leucoleiptes* var. *griseoides* of which he says: "Le dessous obscur au centre seulement" (1947, p. 120).

The above mentioned examples show that it is not a case of either — or whether the colour of the underside is pale or dark, but there exist intermediate stages. I should like to stress this fact, the importance of which was already fully realised by Lynge.

Leaving the structure of the rhizinae alone for a moment, I will discuss the structure of the lower side. Nádvorník rightly observed (1947, p. 71) that apart from the types of lower side found in the *grisea* and "*leucoleiptes*" group, there is another type which differs in that it is pale at the tips of the lobes, but becomes increasingly covered with dark fibres towards the middle of the thallus so as to form "une espèce d'enduit foncé et continu, ce qui fait l'impression du dessous réellement sombre. Quand on humecte un tel envers, généralement les veines noires ressortent distinctement sur la base claire et même dans les endroits qui paraissent tout noirs". Nádvorník considers this type of underside specific of *Ph. farrea* and related forms. As a matter of fact, he is right in the case of f. *semifarrea* Vain. and partly so in the case of f. *brunnea* Harm., the type material of both of which I have examined, but I wonder how the lower surface of the thallus in the Acharian type of *Parmelia farrea* looks like. However, even if it would turn out to be as described by Nádvorník, I do not think the "*farrea*"-underside essentially different from the *grisea*- and "*leucoleiptes*"-underside. Of the "*leucoleiptes*" group I only examined the type material of f. *enteroxanthella* Harm., as well as f. *caesiascens* (Zahlbr., Lich. rarior., no 358, and a specimen in herb. Erichsen, collected by Lettau). The under cortex in these forms appeared to be made up of a very dense, black plectenchyma, distinctly separated from the loosely interwoven medullary tissue.

In some specimens of f. *brunnea* Harm., a form which Nádvorník considers to belong to the "*farrea*" group, I found that the lower side either consists of a very loose plectenchymatous cortex which gradually passes into the medulla, or is hardly corticated at all which conforms to the situation as in *grisea*. In either case loose hyphae or strands of hyphae of the outermost parts only had taken on a brown hue, accounting for the "veines noires". In other specimens of f. *brunnea*, however, going from the tips of the lobes to their base, I found this type of underside gradually turn into the "*leucoleiptes*" type which should not surprise us, since the under cortex in typical *grisea* itself is known to vary from non existing via plectenchyma to paraplectenchyma. This at once eliminates the main difference which Nádvorník in his key (1947, p. 109) mentions to exist between *Ph. grisea* and *Ph. farrea*.

In the foregoing it is shown that I can find no more specific difference between *Ph. grisea* and *Ph. leucoleiptes* than between the latter and *Ph. farrea*, which comes down to the full agreement of my views with those originally expressed by Lynge.

With regard to the structure of the rhizinae, Nádvorník correctly observed that they are "soit ... pulpeuses, peu rameuses, soit ... fibrilleuses à la surface". Whereas the former are found in forms with a mainly pale underside, the latter seem without exception to occur in such forms of which the lower side is predominantly black. Usually, the rhizinae start as simple excrescences at the tips of the lobes, but soon get covered with a tangled mass of black fibrils.

Occasionally, isidia and soredial isidia do occur in this species, but few authors thought it necessary to pay special attention to them. For all I know, Elenkin (in Notul. Syst. Inst. Cryptog. Horti Bot. Petropol., vol. 1, 1922, p. 31) was the first to make mention of some isidiate forms, but from the short latin diagnoses it cannot possibly be gathered whether the author has seen genuine isidia with a thalline cortex, or soredial isidia.

Harmand (in Bull. Soc. Sci. Nancy, ser. 2, vol. 31, (1896) 1897, p. 61) also noticed the presence of isidia: "... garnis sur les bords de sorédies cendrées, ..., ou d'excroissances granuleuses-isidioides", but apparently he did not consider them sufficiently important to base a form on.

Much in the same way Schade (in Hedwigia, vol. 58 B, 1938, p. 94—95) thought little of the value of the isidia as a specific character in the case of *Physcia perisidiosa*. This species Erichsen separated from *Ph. pulverulenta* (in Verh. Bot. Ver. Prov. Brandenburg, vol. 72, 1930, p. 57) on account of the presence of isidia. It may be noted that a possible connection with *Ph. grisea* was not even discussed. Yet, this relation was instantly clear to Schade who saw the authentic specimens of Erichsen. He wrote: "Wenn man ferner die Sorale gewöhnlicher *Ph. grisea* unter dem Mikroskop bei auffallendem Licht betrachtet, findet man ganz dieselben isidienähnlichen, dunklen, braunen Sprossungen wie bei *perisidosa*..." (l. c., p. 94), and "Alle diese Beobachtungen zeigen einwandfrei, dass die scheinbaren Isidiengruppen in der Entwicklung zurückgebliebene, jedenfalls nur noch nicht zerfallene Sorale sind, die allein kein Artmerkmal abgeben können". He nevertheless refrains from facing the consequences of transferring *perisidiosa* to *grisea* or reducing it so synonymy. On studying the type material of Erichsen's *Ph. perisidiosa,* I found the excrescences ecorticated. They are no genuine isidia, therefore, but soredial isidia in the sense of Du Rietz. Several isidia appeared to have disintegrated into soredia. I fully agree with Schade that there is no need of describing a new species on account of the presence of such soredial isidia, and even maintaining the epithet *perisidiosa* for a separate form may be subject to discussion.

An example of isidial soredia seems to occur in what Gyelnik called var. *neogrisea* (in Ann. Mycol., vol. 30, 1932, p. 448).

Truly isidiate forms have been described by Lynge (f. *hillmannii* in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 177) and by Nádvorník (f. *euisidiata* in Stud. Bot. Cechoslov., vol. 8, 1947, p. 119) of which I have not seen the types.

As far as this country is concerned, the species shows the following variability. The medulla, usually being white, is yellow in f. *enteroxanthella.* Strong development of the soredia in the central parts of the thallus is seen in f. *sorediosa.* f. *subnitens* is characterised by a very smooth, somewhat shiny and little pruinose upper side of the lobes. Whereas in most forms the pruina is white, it is bluish in f. *caesiella.* Marginal soralia are common to many forms in this species, but it is rare to have the margins reflexed in places so as to give the impression of labriform soralia. This is the case in f. *farrea.* Strikingly different from the forms mentioned is f. *harmandii* (= f. *brunnea*) of which the central lobes are crowded, ascending, imbricate, and fringed with confluent soralia.

Once in a while there may be found specimens encrusted with a thick, white pruina. Yet, they cannot be called f. *alphiphora* (Ach.) Lynge, since they lack the characteristic *farrea*-like type of soralia and the black lower surface.

Key to the forms.

- 1a. Medulla white 2
  - 2a. Centre of the thallus completely turned into a sorediose crust f. **sorediosa** (Malbr.) Maas G.
  - 2b. Not so 3
    - 3a. Lobes more or less pruinose, pruina white 4
      - 4a. Central lobes crowded, ascending, imbricate, little pruinose, surrounded by a sorediose fringe . . . . f. **harmandii** Maas G.
      - 4b. Not so 5
        - 5a. Sorediose margins of the lobes without reflexed parts which look like lip-shaped soralia 6
          - 6a. Upper side of the lobes very smooth, somewhat shiny, very little pruinose . . . . . . f. **subnitens** (Vain.) Räs.
          - 6b. Upper surface more or less wrinkled and folded, pruina usually well-developed . . . . f. **grisea**
        - 5b. Sorediose margins with upturned parts which resemble labriform soralia . . . . f. **farrea** (Ach.) Lynge
    - 3b. Pruina bluish 7
      - 7a. Lobes densely caesio-pruinose . . . . f. **caesiella** Erichs.
      - 7b. Pruina limited to the tips of the lobes; soredia sometimes caesio-pruinose . . . . f. **harmandii** Maas G.
- 1b. Medulla and soredia yellow . . . . . f. **enteroxanthella** (Harm.) Erichs.

f. **grisea** — *Lichen pityreus* Ach., Lich. Suec. Prodr., 1798, p. 124 — *Physcia grisea* f. *pityrea* Flagey in Rev. de Mycol., vol. 13, 1891, p. 110;

A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 623 (pro var.); vol. 10, 1940, p. 653 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 173 — *Physcia grisea* f. *brunnea* Mereschk. in Ann. Cons. Jard. Bot. Genève, vol. 21, 1919, p. 195.

Type collection: *Lichen griseus* Lamarck in Mus. Nation. Hist. Natur., Lab. Cryptog., Paris.

Exsiccata: Arnold, Lich. Monac., no 89 (pr. p. ad f. *sorediosam* vergens); Claud. et Harm., Lich. Gall. exs., no 73; Hepp. Flecht. Europ., no 876; Kryptog. exs. Vindob., no 1980, 2780; Malbranche, Lich. Normand., no 70; Nádvorník, *Physciac.* exs., no 19; Reichenb. et Schub., Lich. exs., no 87; Schaerer, Lich. Helvet. exs., no 487.

Iconography: Anders, Strauch- u. Laubfl. Mitteleurop., 1928, tab. 30, fig. 5; Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 35—37, fig. 213—225; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 12, fig. 1, 3, 4; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 15, fig. 1.

Description — Lobes rather long and narrow, closely contiguous or overlapping, folded in the centre, appressed and plane or somewhat concave at the tips, with margins becoming increasingly sorediose towards the centre of the thallus, grey-brown to grey-green, more or less pruinose.

Remarks. Mr. R. Lami of the Laboratoire de Cryptogamie in Paris was so kind as to send me most beautiful photographs of some specimens of the type material of *Lichen griseus* which enabled me to check them with Acharius's description of *Lichen pityreus* (l. c.) and *Parmelia pityrea* (Lich. Un., 1810, p. 483—484). The description Lynge gave of f. *pityrea* and part of his material which I had on loan from the Oslo herbarium also conform to the photographs. The identity found gives strong evidence that f. *pityrea* is synonymous to f. *grisea*, the type form.

Investigation of Mereschkovsky's type specimen of *Ph. grisea* f. *brunnea* showed this form to be ordinary f. *grisea* with the upper side of the lobes slightly more brown than grey-brown. The specimen has apparently been linked with less brown specimens lower down the trunk of the tree from which it was collected, for on his label Mereschkovsky added: "plus bas le thalle devient gris clair..."

Of the forms known to occur in this country f. *grisea* is the commonest one, but it will cause no surprise that in so variable a species stages intermediate between f. *grisea* and other forms are numerous.

f. **enteroxanthella** (Harm.) Erichs. in Verh. Bot. Ver. Prov. Brandenburg, vol. 72, 1930, p. 56 — *Physcia pityrea* var. *enteroxanthella* Harm. in Bull. Soc. Sci. Nancy, ser. 2, vol. 31, (1896) 1897. p. 258 — *Physcia leucoleiptes* f. *enteroxanthella* Mereschk., Enum. Lich. Prov. Balt., 1913, p. 33 (non vidi); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 641 (ubi lit. et synon.).

Type collection: *Physcia pityrea* var. *enteroxanthella* Harm. in Lab. Bot. Univers. Cathol. Ouest, Angers.

Exsiccatum: Claud. et Harm., Lich. Gall. exs., no 268.

Description — Medulla and soralia yellow, for the rest extremely variable in general appearance. The development of the soredia and the pruina may range from very slight to very strong. Lower surface black in the centre, brownish or whitish towards the tips of the lobes. Rhizinae black, fibrillose. K intensifies the yellow colour of the medulla.

Remarks. Transitional phases to other forms are common, in fact, one may just as well state that it is common to find the other forms with the medulla white or yellow. Harmand's type material itself is far from homogeneous. This raises the question whether f. *enteroxanthella* should be maintained at all, ranging the colour of the medulla in *Ph. grisea* among those characters, on which it is impossible to base any form.

f. **sorediosa** (Malbr.) Maas G. nov. comb. — *Physcia pityrea* var. *sorediosa* Malbr. apud Oliv. in Rev. Bot., vol. 10, 1892, p. 620 — *Physcia grisea* var. *sorediosa* (Malbr.) Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, p. 536; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 625 (ubi lit. et synon.).

Description — Soralia at the margins of the lobes confluent, spreading over the upper surface of the thallus and eventually developing into a dense and areolate sorediate crust. Lobes sometimes only visible at the circumference.

Remarks. A form not uncommon in this country and connected with f. *grisea* by numerous intermediate phases.

f. **subnitens** (Vain.) Räs. in Medd. Soc. F. Fl. Fenn., vol. 46, (1919—1920) 1921, p. 168; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 622 et vol. 10, 1940, p. 653 (ubi lit. et synon.); Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 175 — *Physcia pulverulenta* subsp. *farrea* f. *subnitens* Vain. in Medd. Soc. F. Fl. Fenn., vol. 6, 1881, p. 132.

Type collection: *Physcia farrea* f. *subnitens* in Inst. Bot. Univers. Turkuensis, Turku.

Exsiccatum: Rabenhorst. Lich. Europ., no 909.

Description — Differs from f. *grisea* by the lobes being smooth, slightly shiny and presenting a faint pruina only at the very tips. Upper side grey-brown to brown. Soralia marginal, in places confluent.

Remarks. The description Lynge gave of f. *subnitens* conforms well to the specimen we have in Rabenhorst, no 909 which is an almost perfect rosette. Vainio refers to this exsiccatum, but the type material which I have examined looks different. Instead of being "recht verlängert, ... zuletzt längs den ganzen, leicht aufgebogenen Seitenrändern sorediös, daher recht schmal", the lobes range from rather long to rather short, growing rather irregularly, some of them even being somewhat discrete. Margins plane or occasionally incurved, either sparingly sorediate or in places covered with confluent soralia. Tips of some of the central lobes somewhat sorediate. Upper side ochry yellow.

On account of these differences it is difficult to put into words those features which Vainio had in mind, unless the 2 salient features which type material and our specimen of Rabenhorst's exsiccatum have in common, viz. the smoothness of the upper surface and the almost total lack of pruina, are the only characters that matter.

In that case some specimens in the indigenous material of *Ph. grisea* may be referred to f. *subnitens*. Most of the specimens, however, which I had formerly identified as f. *subnitens*, do not belong here. They can best be described as dark-coloured, (almost) epruinose modifications of f. *grisea*.

The present form may be told from f. *harmandii* by the central lobes which are not imbricate, by the (almost total) lack of confluent soralia at the tips of the lobes and by the smooth upper side.

f. **caesiella** Erichs. in Verh. Bot. Ver. Prov. Brandenburg, vol. 72, 1930, p. 55; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 623.

Type collection: *Physcia grisea* var. *detersa* f. *caesiella* Erichs. in Staatsinstitut für allgem. Botanik, Hamburg.

Description — Upper side of the thallus red-brown, densely caesiopruinose. Lower side dark brown to black, with a lighter margin.

Remarks. It should be noted that Erichsen considered his form to belong to var. *detersa* which, according to Lynge's description (p. 174), is characterised by long, narrow, discrete, dark-coloured lobes with a faint pruina at the tips only. It does not seem advisable to connect *caesiella* (densely pruinose, contiguous lobes) with *detersa* (faintly pruinose, discrete lobes).

According to Erichsen, his f. *caesiella* would differ from f. *caesiascens* (Lettau) Erichs. in that the latter has the type of soralia characteristic of what he calls var. *leucoleiptes,* that is "nur mit Randsoralen, die sich besonders im peripherischen Teil des Lagers entwickeln". Besides, f. *caesiascens* has the lobes more discrete, much in the same way as in *Ph. muscigena.* f. *caesiella,* on the contrary, has contiguous lobes, whereas the soralia are confined to the central parts of the thallus.

Apart from the somewhat less developed pruina, our indigenous specimens conform to Erichsen's type, rather than to f. *caesiascens* of which I have studied Zahlbr., Lich. rarior., no 358, as well as a specimen in herb. Erichsen, collected by Lettau (Oberhof, Thür. Wald, a. Acer, 750 m. 11/10 1908) which may represent the syntype.

If one does not feel like attaching too much significance to the above mentioned differences, the present form should be called f. *caesiascens,* since Lettau's form (in Hedwigia, vol. 52, 1912, p. 254) was published many years prior to Erichsen's.

f. **farrea** (Ach.) Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 175; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 653 — *Parmelia farrea* Ach., Lich. Un., 1810, p. 475 — *Physcia grisea*; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 619 (pro parte!; ubi lit. et synon.).

Type collection: *Parmelia farrea* Ach. in the Botanical Museum, Helsinki.

Exsiccatum: Magnusson, Lich. sel. scand. exs., no 415.

Iconography: Galløe, Natur. Hist. Danish Lich., vol. 8, 1950, tab. 37, fig. 226—227 (not quite typical).

Description — Lobes grey-brown to dark brown, more or less pruinose at the tips, more or less appressed, not imbricate, with ascending, flexuous margins. Soralia marginal and, in places, also terminal, confluent. A noteworthy character are the reflexed parts of the sorediose margin which resemble labriform soralia.

Remarks. A photograph enabled me to study the type material of *Parmelia farrea.* Consideration of both this photograph and Lynge's description shows that the indigenous specimens identified as f. *farrea* come close to it, but differ in that the marginal soralia are poorly developed. Even this modification is rare in our country.

f. **harmandii** Maas G. nom. nov. — *Physcia pulverulenta* var. *leucoleiptes* f. *brunnea* Harm., Lich. France, vol. 4, 1909, p. 636 — *Physcia leucoleiptes* f. *brunnea*; Migula, Fl. Deutschl.. Abt. 2, vol. 12, 1924, p. 57 (non vidi); Kryptog.-Fl. Deutschl., vol. 4, pars 1, 1929, p. 57; A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 641 — *Physcia grisea* f. *brunnea* (Harm.) Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 176.

Type collection: *Ph. pulverulenta* var. *leucoleiptes* f. *brunnea* Harm. in Lab. Bot. Univers. Cathol. Ouest, Angers.

Exsiccatum: Claud. et Harm., Lich. Gall. exs., no 494.

Description — Thallus growing in rosettes, upper side light brown to dark chestnut, usually epruinose or only slightly pruinose at the tips of the lobes, sometimes somewhat shiny. Peripheral lobes appressed, more or less plane, esorediate or with a few marginal soralia. Central lobes more imbricate and ascending, frequently concave on account of the flexuous and ascending margins, usually short, with confluent marginal and terminal soralia. Soredia whitish or yellowish or caesio-pruinose. Lower side black-brown at the base of the lobes, lighter brown to almost white at the tips. Rhizinae black, fibrillose.

Remarks. When mentioning f. *brunnea* Harm., Lynge was the first to make the new combination. It appears, however, that in this combination the subdivisional epithet is a later homonym, *Ph. grisea* f. *brunnea* having already been described by Mereschkovsky (in Ann. Cons. Jard. Bot. Genève, vol. 21, 1919, p. 195). On examination of Mereschkovsky's type specimen, it appeared that his form is in no way connected with Harmand's *brunnea*, but conforms to ordinary f. *grisea*.

The present form is rare in this country and the specimens are not quite typical.

In connection with f. *harmandii*, it may be useful to discuss f. *semifarrea* (Vain.) Lynge, though it does not occur here. *Semifarrea* was originally described as a form of *Ph. pulverulenta* ** *farrea* (in Medd. Soc. F. Fl. Fenn., vol. 6, 1881, p. 132), and subsequently transferred by Lynge to *Ph. grisea* (in Rabenh., l. c., p. 176). The following description has been drafted from Vainio's type material which was collected in Mäntyjóki, Finland: upper side of the lobes grey-brown to red-brown, almost entirely covered with a thick white or bluish pruina. Peripheral lobes appressed, strongly incised, with ascending margins which soon turn sorediose. Central lobes split up into numerous, crowded, upright, imbricate lobules with sorediate tips.

Other collections identified by Vainio and also put at my disposal show that the material is far from homogeneous. In some specimens the lobes may be traced down to the centre of the thallus, in others the centre is a profusion of short, ascending, imbricate lobules. The thalli may be hardly to strongly sorediate, densely caesio-pruinose to (almost) epruinose. Such epruinose specimens resemble f. *harmandii* indeed.

Since the author clearly states the thallus to be pruinose, and Vainio's description in other respects, too, is in keeping with the type material, I am inclined to regard his later identifications as inadmissable alterations which affect the uniformity of his original form. From this I conclude that f. *harmandii* is not synonymous to f. *semifarrea*, though it is true that both forms are linked up by numerous intermediate phases.

By unfortunate coincidence I have not been able to examine the type specimens, but in all probability in describing his *Ph. lanuginosa* var. *semifarrea* f. *caesiella* (in Ann. Bot. Soc. Zool. Bot. Fenn. Vanamo, vol. 20, 1944, no 3, p. 13) Räsänen meant to distinguish typical *semifarrea* from epruinose specimens which he called f. *subnuda* (l. c., p. 14). In case of identity, *caesiella* is a superfluous epithet, and *subnuda*, if transferred to *Ph. grisea*, synonymous to f. *harmandii*.

Sectio 2. MACROSPERMA (Vain.) Maas G. nov. comb.

— *Physcia* sect. 1. *Euphyscia* b. *Sordulenta* 2. *Macrosperma* Vain. in Act. F. Fl. Fenn.. vol. 7, 1890, pars 1, p. 147 — *Physcia* subgen. *Macrosperma* (Vain.) Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 181.

Thallus light grey or dark, epruinose. *Pycnoconidia* long, filiform, curved. Upper cortex K —.

Remarks. In connection with the isolated taxonomic position of this section, attention may be drawn to the views of Choisy who, in Bull. Soc. Linn. Lyon, vol. 19, 1950, p. 20, for this taxon created the genus *Physciopsis*. This genus was, with disregard of the differences in the quality of the pycnidial fulcra and the spores, combined with the genera *Parmeliopsis*, *Squammaria* and *Lecanora* to form the family of the *Parmeliopsidaceae*.

16. Physcia elaeina (Sm.) A. L. Sm., Monogr. Brit. Lich., ed. 2, vol. 1, 1918, p. 244; Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 181; A. Zahlbr., Cat. Lich. Un., vol. 10, 1940, p. 652 — *Lichen elaeinus* Sm. in Smith et Sowerby, Engl. Bot., vol. 30, 1810, p. 2158 — *Lecanora adglutinata* Flk.. Deutsch. Lich., vol. 4, 1815, p. 7, adnot. 2 (non vidi) — *Parmelia obscura* var. *adglutinata* Schaer., Lich. Helv. Spicil., sect. 9, 1840, p. 442; Van den Bosch in Prodr. Fl. Batav., vol. 2, pars 2, 1853, p. 130; Abelev. in Prodr. Fl. Batav., ed. 2, vol. 2, pars 2, 1898, p. 23 — *Physcia adglutinata* Nyl. in Flora, vol. 45, 1862, p. 355 [1]); A. Zahlbr., Cat. Lich. Un., vol. 7, 1931, p. 585.

Exsiccata: Claud. et Harm., Lich. Gall. exs., no 24, 501; Erb. crittog. Ital., no 468; Hepp, Flecht. Europ., no 374; Massalongo, Lich. Ital. exs., no 245, 246; Mougeot et Nestler, Stirp. Vogeso-Rhen., no 543; Rabenhorst, Lich. Europ., no 687.

Iconography: Lynge in Rabenh., Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, tab. 10, fig. 4; Sántha in Fol. Cryptog., vol. 1, pars 6, 1928, tab. 15, fig. 6 (indistinct); Smith et Sowerby, Engl. Bot., vol. 30, 1810, tab. 2158.

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[1]) Zahlbruckner (l. c.) was right in assuming that Nylander was the first to make this combination except for the date. In Mém. Soc. Imp. Sci. Natur. Cherbourg, vol. 5, 1857, p. 107 Nylander still looked upon *adglutinata* as a subspecies to *Ph. obscura*, and it was not before 1862 that he realised that *adglutinata* is a good species on account of the pycnoconidia being entirely different: "... nec amplius ullum restat dubium quin sit *Physcia adglutinata* species autonoma et distans..."

Macroscopical description — Thallus foliaceous, growing in rosettes, more or less stellate, tiny, 0.5—1 cm in diam., frequently fusing with other thalli and covering larger patches, attached to the substratum by means of rhizinae, deeply incised. Lobes very thin, short and narrow, about 0.5 cm long, 0.2—0.5 mm broad, closely appressed, contiguous or overlapping at the margins, irregularly pinnatifid. Margins entire or somewhat sinuate, plane or corrugated. Tips little or not broadened, incised. Upper side of the lobes grey-green to light or dark grey-brown, darker towards the centre of the thallus, dull or slightly shiny, without pruina or *isidia*, though sometimes warty in the centre, *sorediate*. *Soralia* grey-green or whitish, maculiform, laminal and apical at the tips of the side-lobes, 0.1—0.5 mm in diam., sometimes confluent. Lower side of the lobes white to dirty white, dull, smooth, with a few whitish, very short rhizinae, partly also fastened to the substratum and not detachable without damage. *Microscopical description* — Upper cortex colourless, paraplectenchymatous, 12—15(—18) μ. Gonidia bright green, spherical, 8—18 μ, arranged in clusters or in a continuous layer of 20—50 μ, closely under the upper cortex. Medulla colourless, white in reflected light, rather densely plectenchymatous, 24—60 μ, composed of leptodermatous hyphae. Lower cortex colourless or yellowish, densely plectenchymatous, with the hyphae parallel to the surface, 9—18 μ, or locally lacking. *Apothecia* single or in small groups, laminal, sessile, cup-shaped to discoid, 0.5—0.8 mm in diam. Amphithecium concolorous with the thallus, dull, smooth. Margin persistent, entire or crenate. Disc brown-black, dull, naked. Epithecium brown-yellow, hypothecium yellowish, with clusters of gonidia underneath. Hymenium colourless, 80—90 μ. Asci cylindrical to clavate, 10—15 × 60—75 μ, 8-spored. *Spores* brown-black, 2-celled, little or not constricted in the centre, ellipsoidal, straight or slightly fabiform, with strongly thickened cell-walls at the septum and the rounded apices, 7—10 × 14—18 μ; well-developed spores are rare. Paraphyses simple or branched, septate, conglutinate, capitato-incrassate at the apices. *Pycnidia* not observed. *Chemical reactions* — Upper cortex as well as medulla indifferent to the usual reagents.

Ecology and distribution in the Netherlands. In this country the species has been found on fruit trees, *Aesculus, Populus, Salix*, and, preferably, *Ulmus*. It is a nitrophilous species which has frequently been found on trees in the middle of villages. *Ph. elaeina* which may have been uncommon already in former times, has become decidedly rare nowadays, except on the islands both in the south-west and the north. In my opinion it is the disappearance of our old wayside-trees which more than anything else accounts for the rarity of *Ph. elaeina*. Since, moreover, the species is a weak competitor, the chance of establishing itself in fresh habitats will become even slighter yet.

Distribution in Europe. As may be inferred from the records in literature, *Ph. elaeina* mainly occurs in the southern and central portions of Europe, extending to the west in Great Britain and Ireland, to the north in Denmark and southern Sweden (not in Norway), to the northeast in Estonia. As far as I know, the species seems to be lacking in Finland, whereas I have no records from Poland or the U.S.S.R. Even in countries where the species is known to occur, *Ph. elaeina* is irregularly distributed. Schade (l. c., p. 95) at his time for instance could report no recent finds in Saxony, whereas prior to 1923 no finds were known from Schleswig-Holstein (Erichsen in Schr. Naturwiss. Ver. Schleswig-Holstein, vol. 22, 1937, p. 113).

Remarks. Contrary to what Lynge (l. c., p. 183) wrote about the colour of the lower side of the thallus, I find *Ph. elaeina* white to dingy white underneath. This makes a very good character for distinguishing *Ph. elaeina* in the field from small specimens of *Ph. orbicularis*. Another difference lies in the lower cortex which is plectenchymatous and less than 20 μ in *elaeina*, paraplectenchymatous and more than 20 μ in *orbicularis*. For the rest, it cannot be denied that *elaeina* strikingly resembles a tiny *orbicularis*. From equally small *Ph. nigricans* the present species is well marked off by its laminal maculiform soralia.

Specimens examined.

Friesland: Ameland, Ballum, 6 IX 1951, *Barkman 2824* (L); Paesens, 15 VIII 1951, *Barkman* (L); Terschelling, Midsland, 4 IX 1951, *Barkman 2807* (L); Vlieland, Oost Vlieland, 4 IX 1951, *Barkman 2810, 2814*, c. ap. (L); 1 IV 1948, *Maas G. 4007* (L).

Overijsel: Deventer, 10 X 1951, *Barkman* (L); Kampen, *Bondam*, c. ap. (NBV).

Noord-Holland: Amsterdam, *Van der Sande Lacoste*, c. ap. (NBV); 1849, *Van der Sande Lacoste*, c. ap. (L, NBV); Amsterdam, Kalfjeslaan, XI 1848, *Van der Sande Lacoste*, c. ap. (NBV); Amsterdam-Sloten, I 1849, *Van der Sande Lacoste*, c. ap. (NBV); Texel, De Cocksdorp, 2 IX 1951, *Barkman 2811* (L); Texel, Den Burg, 31 VIII 1951, *Barkman 2819* (L).

Zuid-Holland: Goeree, Goedereede, 15 IV 1952, *Barkman 2906* (L); Schoonhoven, 21 IV 1952, *Barkman 2878* (L); Voorschoten, 16 IV 1944, *Maas G. 3000* (L).

Zeeland: Noord-Beveland, Kortgene-Wissekerke, 23 IX 1951, *Barkman 2852* (L); Schouwen, Renesse-Brouwershaven, 20 IX 1951, *Barkman 2844*, c. ap. (L); Walcheren, Oostkapelle, 25 IX 1951, *Barkman 2859*, c. ap. (L); Zeeuws-Vlaanderen, Breskens, 26 IX 1951(*Barkman 2861* (L); Zuid-Beveland, *Van den Bosch* (NBV); *Van den Bosch*, c. ap. (NBV); IV 1841, *Van den Bosch* (L, NBV); Zuid-Beveland, Ellewoutsdijk, 22 IX 1951, *Barkman 2849* (L); Zuid-Beveland, Goes, *Van den Bosch* (NBV); Zuid-Beveland, Wilhelminadorp, IX 1843, *Van den Bosch*, c. ap. (L).

Noord-Brabant: Bokhoven, 19 III 1905, *Wakker* (L).

References concerning the geographical distribution of the Physciaceae in Europe.

To the references cited in my paper on *Parmeliaceae* (in Blumea, vol. 6, 1947, p. 188—192) the following may be added. Completeness has not been reached.

AUSTRIA.

Klement, O., Zur Flechtenflora der Umgebung von Seefeld in Tirol — Ber. Bayer. Bot. Ges., vol. 27, 1947, p. 191—201.

BULGARIA.

Nádvorník, J., Contribution aux Physciaceae d'Europe — Stud. Bot. Čechoslov., vol. 9, 1948, p. 144—154.

Szatala, Oe., Beiträge zur Flechtenflora von Bulgarien II — Mag. Bot. Lapok, vol. 29, 1930, p. 58—104.

CZECHOSLOVAKIA.

Anders, J., Die Strauch- und Blattflechten Nordböhmens — Böhmisch Leipa, 1906.

——, idem. 2 Nachtrag — Hedwigia, vol. 61, 1920, p. 351—374.

——, idem. 3 Nachtrag — Hedwigia, vol. 63, 1922, p. 269—322.

——, Zur Flechtenflora des Isergebirges — Hedwigia, vol. 64, 1923, p. 256—267.

——, idem. Nachtrag — Hedwigia, vol. 65, 1924, p. 65—84.

——, Die Flechten Nordböhmens. 4 Nachtrag — Beih. Bot. Centralbl., vol. 54 B, 1935, p. 429—488.

Černohorský, Z., Epilithische Flechtengesellschaften der Prager Diabasfelsen — Preslia, vol. 18—19, (1939—1940) 1940, p. 37—52.

——, Flechten der Velká Hora bei Karlstein — Stud. Bot. Čechoslov., vol. 5, 1942, p. 148—155.

Hilitzer, A., Les Lichens des rochers siliceux dans la partie centrale de la plaine de Labe — Preslia, vol. 3, (1923—25), 1925, p. 10—22.

——, Addenda ad lichenographiam Bohemiae series III — Act. Bot. Bohem., vol. 8, 1929, p. 104—118.

——, Ad distributionem lichenum in Carpatis orientalibus — Preslia, vol. 18—19, (1939—1940) 1940, p. 86—96.

Kuták, V., Troisième contribution à la connaissance des lichens de la Bohème — Preslia, vol. 5, 1927, p. 36—51.

Nádvorník, J., Physciaceae Tchécoslovaques — Stud. Bot. Čechoslov., vol. 8, 1947, p. 69—124.

Servít, M., Zur Flechtenflora Böhmens und Mährens — Hedwigia, vol. 50, 1910, p. 51—85.

DENMARK.

Christiansen, M. Skytte, Lavfloraen paa det fredede areal ved strankaer paa Mols — Bot. Tidsskr., vol. 48, 1946, p. 71—87.

Degelius, G., Physcia dubia, P. nigricans och P. sciastra i Danmark — Bot. Tidsskr., vol. 43, 1935, p. 311—312.

Erichsen, C. F. E., Neue dänische Flechten — Ann. Mycol., vol. 40, 1942, p. 140—149.

Lynge, B., Laverne av familien Physciaceae i Danmark — Bot. Tidsskr., vol. 43, 1935, p. 220—231.

Magnusson, A. H., Förteckning över Skandinaviens växter. 4. Lavar — Lund, 1937.

——, Tillägg och ändringar till Skandinaviens växter. 4. Lavar — Uppsala, 1950, stencil.

FINLAND.

Ahlner, S., Flechten aus Nordfinnland — Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo, vol. 9, 1937, no. 1.

——, Einige Flechtenfunde aus Karelien — Svensk Bot. Tidskr., vol. 35, 1941, p. 261—270.

Hakulinen, R., Einige bemerkenswerte Flechtenfunde aus Finnland — Arch. Soc. Zool. Bot. Fenn. Vanamo, vol. 4 (1949) 1950, p. 105.

Lång, G., Lichenes Savoniae Borealis — Act. Soc. F. Fl. Fenn., vol. 34, 1910, no. 3.

Räsänen, V., Über Flechtenstandorte und Flechtenvegetation im westlichen Nordfinnland — Ann. Soc. Zool.-Bot. Fenn. Vanamo, vol. 7, 1927, no. 1.

——, Petsamon Jäkäläkasvisto — Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo, vol. 18, 1943, no. 1.

Vaarna, V. V., Über die epiphytische Flechtenflora der Stadt Helsinki — Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo, vol. 5, 1934, no. 6.

FRANCE.

Abbayes, H. des, Étude écologique des Lichens de l'étage du Hêtre dans la région sud des Monts-Dore (P.-de-D.) — Rev. Bryol. Lichénol., N. S., vol. 7, 1934, p. 5—27.

——, Contributions nouvelles à la connaissance des Lichens armoricains II — Bull. Soc. Sci. Bretagne, vol. 13, 1936, p. 122—144.

Berner, L., Les principaux Lichens des environs de Marseille — Rev. Bryol. Lichénol., N. S., vol. 16, 1947, p. 113—130.

Bouly de Lesdain, M., Recherches sur les Lichens des environs de Dunkerque — Dunkerque, thesis, 1910.

——, Recherches etc., 1er Suppl. — Dunkerque, 1914.

——, Lichens recueillis aux environs de Nice (Alpes-Maritimes) en 1945 et 1946 — Rev. Bryol. Lichénol., N. S., vol. 18, 1949, p. 69—79.

Choisy, M., Catalogue des Lichens de la région lyonnaise — Bull. Soc. Linn. Lyon, vol. 19, 1950, p. 138—141.

Maheu, J., Lichens d'Aix-en-Provence (1926—1927) — Bull. Soc. Bot. France, vol. 77, 1930, p. 597—611.

Nádvorník, J., Contribution aux Physciaceae d'Europe — Stud. Bot. Čechoslov., vol. 9, 1948, p. 144—154.

Ozenda, P., Matériaux pour la flore lichénologique des Alpes-Maritimes — Bull. Soc. Bot. France, vol. 97, 1950, no. 10, p. 29—50.

GERMANY.

Erichsen, C. F. E., Die Flechten des Moränengebiets von Ostschleswig mit Berücksichtigung der angrenzenden Gebiete — Verh. Bot. Ver. Prov. Brandenburg, vol. 72, 1930, p. 1—68.

——, Ein lichenologischer Ausflug nach Mecklenburg — Arch. Ver. Freund. Naturgesch. Mecklenburg, N. F., vol. 11, (1936) 1937, p. 5—31.

——, Weitere Beiträge zur Flechtenflora Schleswig-Holsteins und des Gebiets der Unterelbe — Schr. Naturwiss. Ver. Schleswig-Holstein, vol. 22, 1937, p. 89—116.

——, Neue Beiträge (3.) zur Kenntnis der Flechtenflora Schleswig-Holsteins und des Gebiets der Unterelbe — Ann. Mycol., vol. 36, 1938, p. 128—153.

——, 4. Beitrag etc. — ibidem, vol. 37, 1939, p. 61—87.

——, 5. Beitrag etc. — ibidem, vol. 39, 1941, p. 1—37.

——, 6. Beitrag etc. — ibidem, vol. 40, 1942, p. 163—189.

Grummann, V. J., Die Flechtenflora der Insel Rügen mit Hiddensee — Rep. spec. nov. regn. veg. Beih., vol. 81, 1935, p. 1—56.

Hillmann, J., Beiträge zur Flechtenflora Bayerns II — Ber. Bayer. Bot. Ges., vol. 22, 1937, p. 120—135.

——, Zur Flechtenflora der Mark Brandenburg VI — Verh. Bot. Ver. Prov. Brandenburg, vol. 79, 1939, p. 26—37.

——, Idem VII — ibidem, vol. 82, 1942, p. 100—107.

——, Beiträge zur Flechtenflora Bayerns III — Ber. Bayer. Bot. Ges., vol. 26, 1943, p. 139—150.

Langerfeldt, J., Beiträge zur Flechtenflora Oldenburgs. Lichenologische Beobachtungen im alten Amte Varel — Rep. spec. nov. regn. veg. Beih., vol. 101, 1938, p. 1—25.

Laven, L., Beitrag zur Flechtenflora des Vereinsgebietes — Decheniana, Festschr., vol. 101 AB, 1942, p. 117—130.

Lynge, B. Physciaceae in Rabenhorst, Kryptog.-Fl. Deutschl., ed. 2, vol. 9, pars 6/1, 1935, p. 41—188.

Mattick, Fr., Flechtenvegetation und Flechtenflora des Gebietes der Freien Stadt Danzig — 59 Ber. Westpreuss. Bot.-Zool. Ver., 1937, p. 1—53.

Poelt, J., Beiträge zur Flechtenflora Bayerns — Ber. Bayer. Bot. Ges., vol. 28, 1950, p. 276—289.

Schade, A., Die sächsischen Arten der Flechtenfamilie der Physciaceae sowie die Verbreitung von Physcia caesiella (B. de Lesd.) Suza in Mitteleuropa — Beih. Bot. Centralbl., vol. 58 B, 1938, p. 55—99.

——, Beiträge zur Kryptogamenflora der Ostseeküste von Ostpommern — Rep. spec. nov. regn. veg. Beih., vol. 111, 1939, p. 105—152.

Schindler, H., Flechtenflora von Rudolstadt. Ein Beitrag zur Lichenographie von Thüringen — Beih. Bot. Centralbl., vol. 56 B, 1937, p. 327—352.

Schneider, Th., Zur Flechtenflora der Schwellenburg — Mitt. Thüring. Bot. Ver., N. F., vol. 47, 1941, p. 140—150.

Schwind, J., Flechten aus Südbayern und dem Allgaü — Kryptog. Forsch., vol. 2, 1935, p. 246—254.

Tobler, Fr. & Mattick, Fr., Die Flechtenbestände der Heiden und der Reitdächer Nordwestdeutschlands — Bibl. Bot., Heft 117, 1938.

GREAT BRITAIN.

Crombie, J. M., Lichenes Brittannici — Londini, 1870.

Sowter, F. A., The cryptogamic flora of Leicestershire and Rutland — Leicester, 1950.

Watson, W., Notes on Lichens, mainly from Orkney, in the Herbarium of the Royal Botanic Garden, Edinburgh — Trans. Proc. Bot. Soc. Edinburgh, vol. 31, 1935, p. 505—520.

——, Notes on Lichens in the Herbarium of the Royal Botanic Garden, Edinburgh II — ibidem, vol. 32, 1939, p. 502—515.

——, Notes etc. III — ibidem, vol. 33, 1942, p. 183—208.

——, Notes etc. IV — ibidem, vol. 34, 1945, p. 233—243.

GREECE.

Harmand, J. et Maire, R., Matériaux pour servir à l'étude de la flore et de la géographie botanique de l'orient. VI fasc. Contribution à l'étude des Lichens de la Grèce — Bull. Soc. Sci. Nancy, ser. 3, vol. 10, 1909, p. 143—176.

Szatala, Oe., Contributions à la connaissance de la flore lichénologique de la péninsule des Balkans et de l'Asie mineure — Borbasia, vol. 2, 1940, p. 33—50.

——, Contributions à la connaissance des lichens de la Grèce. I. La presqu'île Athos (Hagion Oros) — Borbasia, vol. 3, 1941, p. 113—136.

HUNGARY.

Gallé, L., Lichenassociationen aus Szeged — Fol. Cryptog., vol. 1, 1930, p. 933—946.

——, Soziologische und floristische Studie über die Flechten der Burgruine von Szeged — Bot. Közlemén., vol. 38, 1941, p. 143—146.

Gyelnik, V., Beiträge zur Flechtenvegetation Ungarns I — Fol. Cryptog. vol. 1, 1926, p. 237—242.

Szatala, Oe., Beiträge zur Kenntnis der Flechtenflora Ungarns — Mag. Bot. Lapok, vol. 24 (1925) 1926, p. 43—75.

——, idem II — ibidem, vol. 25, (1926) 1927, p. 201—218.

Timkó, G., Turócer Flechten — Fol. Cryptog., vol. 1, 1930, p. 830—832.

ICELAND.

Lynge, B., Lichens from Iceland, collected by Norwegian botanists in 1937 and 1939. I. Macrolichens — Skr. Norsk Vid. Akad. Oslo. I. Mat.-Naturvid. Kl., 1940, no. 7.

IRELAND.

Adams, J., The distribution of Lichens in Ireland — Proc. Roy. Irish Acad., sect. B, vol. 27, 1908—1909, p. 193—234.

ITALY.

Cengia-Sambo, M., Due excursione licheniche in Piemonte: Alta valle della Dora Baltea e alta valle d'Ala — Bull. Soc. Bot. Ital., 1925, p. 181—187.

——, Florula Lichenica del Passo de Piccolo S. Bernardo — Ann. Lab. Chanousia Giard. Bot. Alp. Ord. Mauriziano Picc. S. Bernardo, no. 2, 1932.

——, I licheni della Conca di Tesino (Trento) — Stud. Trentini Sci. Natur., vol. 18, 1937, fasc. 2.

——, I licheni della Laguna di Venezia — Arch. Bot., vol. 14, 1938, p. 113—125.

Nádvorník, J., Contribution aux Physciaceae d'Europe — Stud. Bot. Čechoslov., vol. 9, 1948, p. 144—154.

LIECHTENSTEIN.

Dalla Torre, K. W. von & Sarnthein, L. Grafen von, Die Flechten van Tirol, Vorarlberg und Liechtenstein — Innsbruck, 1902.

NORWAY.

Havås, J., Lichenvegetationen ved Mosterhaven — Bergens Mus. Aarb., 1917—1918, Naturvid. Raekke, no. 2.

Lynge, B., A monograph of the Norwegian Physciaceae — Vid. Selsk. Skr. I, Mat.-Naturvid. Kl., 1916, no. 8.

Magnusson, A. H., Förteckning över Skandinaviens växter. 4. Lavar — Lund, 1937.

——, Tillägg och ändringar till Skandinaviens växter, 4. Lavar — Uppsala, 1950, stencil.

POLAND.

Krawiec, F., Die Epiphyten-Flora der Buchenwälder Grosspolens — Act. Soc. Bot. Pol., vol. 11, 1934, Suppl., p. 317—327.

Motyka, J., Études sur la flore lichénologique du Tatra. Première partie. Lichens recueillis dans la vallée Kościeliska — Act. Soc. Bot. Pol., vol. 2, 1924, p. 44—59.

Suza, J., Additamenta ad lichenes Poloniae cognoscendos — Act. Soc. Bot. Pol., vol. 5, 1928, p. 213—219.

Timkó, G., Beiträge zur Flechtenflora von Polen — Bot. Közlemén., vol. 19, (1920—1921) 1921, p. 84—88.

Tyszkiewicz, J., Recherches sur les lichens corticoles dans les forêts de la partie Nord-Est du plateau Kielce-Sandomierz — Pl. Polonica, vol. 3, 1935, p. 1—119.

PORTUGAL.

Coutinho, A. X. P., Lichenum Lusitanorum herbarii Universitatis Olisiponensis catalogus — Lisboa, 1916.

Harmand, J., Notes relatives à la Lichénologie du Portugal. Suite. — Bull. Soc. Bot. France, vol. 56, 1909, p. 27—34.

Tavares, C. N., Sôbre algumas espécies dos géneros Cladonia e Physcia — Bol. Soc. Broteriana, ser. 2, vol. 19, pars 1, 1944, p. 181—199.

——, Líquenes da Serra do Gerès — Portugal. Act. Biol., Ser. B, vol. 3, 1950, no. 1/2; idem in Agronomia Lusit., vol. 12, 1950, p. 123—163.

RUMANIA.

Cretzoiu, P., Neue Flechten aus Rumänien — Verh. Siebenburg. Ver. Naturw., 1940, p. 242—246.

Stamatin, M., Contribution à la flore lichénologique de la Roumanie — Ann. Sci. Univers. Jassy, vol. 3, 1906, p. 79—94.

——, idem II — ibidem, vol. 4, 1906, p. 252—257.

SPAIN.

Abbayes, H. des, Lichens d'Espagne récoltés de 1926 à 1935 par M. et Mme P. Allorge — Rev. Bryol. Lichénol., N.S., vol. 15, (1945) 1946, p. 79—86.

Maheu, J. et Werner, R. G., Lichénographie Catalane des laves d'Olot (Espagne). Comparaison avec la Flore calcaire du massif voisin de Puigsacalm — Rev. Bryol. Lichénol., N. S., vol. 7, 1934, p. 194—212.

SWEDEN.

Ahlner, S., Weitere Beiträge zur Strauch- und Laubflechtenflora von Åsele Lappmark — Ark. f. Bot., vol. 29 A, 1938, no. 9.

——, idem II — ibidem, vol. 30 A, 1940, no. 2.

——, Några lavar från Härnön i Ångermanland — Bot. Notis., 1943, p. 155—159.

——, Lavar från Långans övre vattenområde i västra Jämtland — K. Svensk. Vet. Akad. Skr. Naturskyddsär, 1944, no. 44.

Almborn, O., Lavfloran i Botaniska trädgården i Lund — Bot. Notis., 1943, p. 167—177.

Magnusson, A. H., Två lavexkursioner i västra Sverige — Medd. Göteborgs Bot. Trädg., vol. 11, 1936, p. 43—60.

——, Förteckning över Skandinaviens växter. 4. Lavar — Lund, 1937.

——, Tillägg och ändringar till Skandinaviens växter. 4. Lavar — Uppsala, 1950, stencil.

SWITZERLAND.

Lettau, G., Schweizer Flechten I — Hedwigia, vol. 60, 1918, p. 84—128.

——, idem II — ibidem, vol. 60, 1919, p. 267—312.

Meylan, Ch., Contribution à la connaissance des Lichens du Jura — Bull. Soc. Vaud. Sci. Natur., vol. 54, 1922, p. 287—294.

——, La flore bryologique et lichénologique du bloc erratique de la Grange de la Côte — ibidem, vol. 56, 1926, p. 165—172.

——, Nouvelle contribution à la connaissance des Lichens du Jura, avec quelques indications de localités des Alpes — ibidem, vol. 56, 1926, p. 173—178.

——, Troisième contribution à la connaissance des Lichens du Jura — ibidem, vol. 57, 1930, p. 213—218.

——, 4me Contribution à la connaissance des Lichens du Jura — ibidem, vol. 59, 1936, 15—20.

Nádvorník, J., Contribution aux Physciaceae d'Europe — Stud. Bot. Čechoslov., vol. 9, 1948, p. 144—154.

U. S. S. R. (European part).

Andres, H., Beiträge zur Kryptogamenflora Wolhyniens I — Hedwigia, vol. 67, 1927, p. 214—222.

Kreyer, G. K., Contributio ad floram lichenum gub. Mohilevensis annis 1908—1910 lectorum. Suppl. — Act. Hort. Petropol., vol. 31, 1913, p. 263—440.

Oxner, A., Matériaux pour la flore des Lichens de la Bélarussie — Bull. Jard. Bot. Kieff, vol. 1, 1924, p. 27—36.

——, Neue und bis jetzt für die Ukraïne wenig bekannte Flechtenarten — ibidem, vol. 2, 1925, p. 20—28.

Steiner, J., Flechten aus Transkaukasien — Ann. Mycol., vol. 17, 1919, p. 1—32.

Szatala, Oe., Lichenes in Peninsula Taurica et in Caucaso ab F. Kamienski, D. Sosnowsky et E. Koenig collecti — Borbasia, vol. 4, 1942, p. 70—96.

YUGOSLAVIA.

Kušan, F., Beitrag zur Kenntnis der Flechtenflora des Papuk-Gebirges in Slawonien — Hedwigia, vol. 74, 1935, p. 285—296.

——, Über die Flechtenvegetation auf Kalkfelsen in mittlerem Dalmatien — Act. Bot. Inst. Bot. Univ. Zagreb., vol. 10, 1935, p. 33—49.

Nádvorník, J. Contribution aux Physciaceae d'Europe — Stud. Bot. Čechoslov., vol. 9, 1948, p. 144—154.

Sántha, L., Beiträge zur Flechtenflora der Umgebung von Kapronca (Koprivnica) — Bot. Közlemén., vol. 20, (1922) 1924, p. 56—66.

Servít, M., Zur Flechtenflora Norddalmatiens — Mag. Bot. Lapok, vol. 9, 1910, p. 164—193.

Szatala, Oe., Beiträge zur Flechtenflora der Insel Arbe — Mag. Bot. Lapok, vol. 26, (1927) 1928, p. 27—45.

——, Enumeratio Lichenum a cl. F. Fóriss in Galicia lectorum — Fol. Cryptog., vol. 1, 1930, p. 985—988.

Index

New names or new combinations in heavy type; synonyms or misapplied names in italics; page number in heavy type denotes a description.

- *adglutinata* Flk. (*Lecanora*) 277
- *adglutinata* Nyl. (*Physcia*) 277
- adscendens (Th. Fr.) Oliv. sensu Bitt. (Physcia) 216, 232, **235**
  - f. distracta Lettau 238
  - f. orbicularis Bouly de Lesd. 238
- aipolia (Ehrh.) Hampe (Physcia) 217, **218**
  - f. aipolia 221
  - f. caesiopruinosa Arn. 221
  - f. melanophthalma (Mass.) Sántha 221
  - f. verruculosa Vain. 221
  - var. acrita (Ach.) Hue 221
  - var. angulosa Sántha 221
  - var. anthelina 221
  - var. cercidia Ach. 221
- *aipolius* Ehrh. (*Lichen*) 218
- albinea (Physcia) 231, 248
- *allochrous* Ehrh. (*Lichen*) 264
- *ambiguus* Ehrh. (*Lichen*) 223
- *ambiguus* Wulf. (*Lichen*) 223
- Anaptychia Körb. **209**
  - sect. Albidopallidae Räs. 210
  - sect. Melancholia Räs. 210
- *angustatus* Hoffm. (*Lichen*) 265
- *aquila* Ach. (*Parmelia*) 213
- *astroidea* Clem. (*Parmelia*) 229, **230**
  - var. *Clementiana* 228
- *astroidea* (Clem.) Nyl. (*Physcia*) 228
  - f. pollinifera des Abb. 231
  - var. caricae (Ach.) Colmeiro 230
- biziana (Physcia) 231
- *caesia* Ach. (*Parmelia*) 225
- caesia (Hoffm.) Hampe (Physcia) 216, **225**
  - f. corticola Eitner 227
  - f. dendritica Anders 227
  - f. panniformis Anders 227
  - f. pruinosa Eitner 227
  - var. corticola Kullhem 227
  - var. *dubia* (Hoffm.) Th. Fr. 244
- *caesiella* (Bouly de Lesd.) Suza (*Physcia*) 242
- caesitia Nyl. (Physcia) 247
- *caesius* Hoffm. (*Lichen*) 225
- Caricae Clem. (Parmelia) 230
- ciliaris (L.) Körb. (Anaptychia) **210**
  - f. actinota (Ach.) Arn. 212
  - f. agriopa (Ach.) Boist. 212
  - f. verrucosa (Ach.) Boist. 212
- *ciliaris* L. (*Lichen*) 210
- *ciliaris* Ach. (*Parmelia*) 210
- ciliata (Hoffm.) DR. (Physcia) 217, 249, **250**
- *ciliatus* Hoffm. (*Lichen*) 250
- *Clementi* Sm. (*Lichen*) 228
- *Clementi* Turn. (*Parmelia*) 230
- clementi (Sm.) Lynge (Physcia) 216, **228**
- *Clementiana* Ach. (*Parmelia*) 228
- *Clementiana* Kickx (*Physcia*) 228
- cycloselis f. elongata Räs. (Physcia) 251
- *dimidiata* (Arn.) Nyl. (*Physcia*) 247
- *dubia* Hoffm. (*Lobaria*) 244
- dubia (Hoffm.) Lettau (Physcia) 216, 242, **244**
  - f. *angusta* Lynge 244, 247
  - f. *lata* Lynge 247, 248
- elaeina (Sm.) A. L. Sm. (Physcia) 217, **277**
- *elaeinus* Sm. (*Lichen*) 277
- *farrea* Ach. (*Parmelia*) 270, 275
- farrea (Physcia) 271
  - f. subnitens Vain. 274
- fusca (Huds.) Vain. (Anaptychia) 210, **213**
  - var. stippaea (Ach.) Lynge 214
- *fuscus* Huds. (*Lichen*) 213
- grisea (Lam.) A. Zahlbr. (Physcia) 217, 260, **267**
  - f. albida Nádv. 269
  - f. alphiphora (Ach.) Lynge 270, 272
  - f. *brunnea* (Harm.) Lynge 270, 276
  - f. *brunnea* Mereschk. 273, 276
  - f. caesiascens (Lettau) Erichs. 270, 275
  - f. caesiella Erichs. 272, **275**
  - f. enteroxanthella (Harm.) Erichs. 270, 272, **273**
  - f. euisidiata Nádv. 272
  - f. farrea (Ach.) Lynge 272, **275**
  - f. grisea **272**
  - f. **harmandii** Maas G. 272, **276**
  - f. hillmannii Lynge 272
  - f. *pityrea* Flagey 270, 272
  - f. semifarrea (Vain.) Lynge 270, 276
  - f. **servediosa** (Malbr.) Maas G. 272, **274**
  - f. subnitens (Vain.) Räs. 270, 272, **274**

- var. detersa 275
  - f. caesiella Erichs. 275
- var. *leucoleiptes* f. *brunnea* Harm. 270, 271, 276
- var. neogrisea Gyel. 272
- var. *sorediosa* (Malbr.) Sántha 274

griseus Lam. (*Lichen*) 267, 273

hispida Frege (*Physcia*) 235, 238
- var. *leptalea* A. Zahlbr. 232

hispidus Schreb. (*Lichen*) 235, 238

intermedia (Physcia) 243

lanuginosa var. semifarrea f. caesiella Räs. (Physcia) 277
- f. subnuda Räs. 277

leptalea (Ach.) DC. (Physcia) 216, **232**
- var. albescens Oliv. 235
- var. soralifera Erichs. 235

leptaleus Ach. (*Lichen*) 232

leucoleiptes (Physcia) 269
- f. *brunnea* 276
- f. *enteroxanthella* Mereschk. 273
- var. griseoides 270

lithotea var. *sciastrella* Nyl. (*Physcia*) 257

melops (Physcia) 231

muscigena (Physcia) 275

nigricans Flk. (*Lecanora*) 257

nigricans (Flk.) Stizenb. (Physcia) 217, 250, **257**
- f. nigricans 259
- f. pallescens (Harm.) Lynge 259
- f. parvula (Vain.) Nádv. 259
- f. **tremulicola** (Nyl.) Maas G. **259**
- var. *sciastrella* (Nyl.) Lynge 257, 258
- var. tremulicola (Nyl.) Lynge 258
  - f. atra Lynge 259

obscura (*Parmelia*) 250, 253
- var. *adglutinata* Schaer. 277
- var. aurella Kbr. 257
- var. *chloantha* 253
- var. *ciliata* 253
- var. *nigricans* Körb. 257
- var. *orbicularis* 253

obscura f. *orbicularis* (Neck.) Th. Fr. (*Physcia*) 253
- var. *ciliata* Tuck. 250
- var. sorediifera Nyl. 256
- var. sorediosa Nyl. 256
- var. *virella* f. *Hueiana* Harm. 256

orbicularis Neck. (*Lichen*) 253

orbicularis (Neck.) Pötsch (Physcia) 217, 250, **253**
- f. elongata Räs. 251, 255
- f. **gracilis** (Mereschk.) Maas G. **255**
- f. hueana (Harm.) Erichs. 252, **256**
- f. orbicularis 256
- f. pallida Räs. 255
- f. tristis Räs. 255

parvula Vain. (Physcia) 259

perisidiosa Erichs. (Physcia) 241, 271, 272

Physcia (Schreb.) Th. Fr. em. Vain. 209, **215**

Physcia Schreb. (*Lichen*) 215

Physcia
- sect. *Dirinaria* (Tuck.) Vain. 215
- sect. *Euphyscia* Th. Fr. 216
  - b. *Sordulenta* 1. *Brachysperma* Vain. 277
  - 2. *Macrosperma* Vain. 277
- sect. Parvulae Räs. 216
- subgen. *Brachysperma* (Vain.) em. Lynge 217
  - sect. *Astroidea* Lynge 228
  - sect. *Caesia* Lynge 225
  - sect. *Obscura* Lynge 249
  - sect. *Pulverulenta* Lynge 260
  - sect. *Stellaris* Lynge 218
  - sect. *Tenella* Lynge 232
  - sect. *Tribacia* Lynge 241
- subgen. Euphyscia Th. Fr. 215, **216**
  - sect. 1. **Brachysperma** (Vain.) em. Maas G. 217, **218**
    - subsect. 3. **Astroidea** (Lynge) Maas G. 218, **228**
    - subsect. 2. **Caesia** (Lynge) Maas G. 218, **225**
    - subsect. 6. **Obscura** (Lynge) Maas G. 218, **249**
    - subsect. 7. **Pulverulenta** (Lynge) Maas G. 218, **260**
    - subsect. 1. **Stellaris** (Lynge) Maas G. **218**
    - subsect. 4. **Tenella** (Lynge) Maas G. 218, **232**
    - subsect. 5. **Tribacia** (Lynge) Maas G. 218, **241**
  - sect. 2. **Macrosperma** (Vain.) Maas G. 217, **277**
- subgen. Hyperphyscia (Müll. Arg.) A. Zahlbr. 215
- subgen. Hypomelaena (Trevis.) Vain. 215
- subgen. *Macrosperma* (Vain.) Lynge 277
- subgen .Tetramelaena (Trevis.) A. Zahlbr. 215

Physciaceae **209**

Physciopsis Choisy 277

pityrea Ach. (Parmelia) 273

pityrea
- var. *enteroxanthella* Harm. (*Physcia*) 273
- var. *sorediosa* Malbr. 274

pityreus Ach. (*Lichen*) 272, 273

pulverulenta Ach. (*Parmelia*) 260
- var. *allochroa* Schaer. 264
- var. *angustata* Ach. 265
- var. *argyphaea* Ach. 264
- var. leucoleiptes Tuck. 269
- var. *turgida* Schaer. 266
- var. *venusta* Genth 265

  var. vulgaris f. polita Fw. 262
pulverulenta (Schreb.) Hampe (Physcia) 217, **260**
  f. angustata (Hoffm.) Leight. 262, 263, **265**
  .f argyphaea (Ach.) Oliv. 262, 263, **264**
  f. fusca Bouly de Lesd. 262
  f. nuda Harm. 262, 263, **265**
  f. panniforis Cromb. 267
  f. polita 264
  f. pulverulenta 262, 263, **264**
  f. subpapillosa (Cromb.) Erichs. 262, 263, **266**
  f. turgida (Schaer.) Oliv. 262, 263, **266**
  f. venusta (Ach.) Sandst. 262, 263, **265**
  var. *allochroa* Th. Fr. 264
  var. *angustata* Nyl. 265
    f. nuda Mereschk. 263
  var. *argyphaea* (Ach.) Nyl. 264
  subsp. farrea
    f. semifarrea Vain. 276
    f. subnitens Vain. 274
  var. *grisea* Kickx 267
  var. imbricata B. de Lesd. 267
  var. *leucoleiptes* f. *brunnea* Harm. 276
  var. rufescens Mereschk. 262
    f. atrynea Mereschk. 262
  var. *subpapillosa* Cromb. 266
  var. subvenusta Nyl. 263
  var. *turgida* Mong. 266
  subsp. *venusta* Nyl. 265
  var. *venusta* 265
pulverulentus Schreb. (*Lichen*) 260, 264
sciastra (Physcia) 259
sciastrella
  f. nigrescens Harm. (Physcia) 259
  f. pallescens Harm. 259
stellaris L. (*Lichen*) 221
  f. *tuberculata* Kernst. (*Parmelia*) 223
  var. *aipolia* Fr. 218
  var. *ambigua* Schaer. 221
  var. *hispida* Fr. 232, 235, 239
  var. *radiata* Ach. 224
  var. *rosulata* Ach. 225
stellaris (L.) Nyl. (Physcia) 217, 218, **221**
  f. ambigua Rabenh. 223
  f. granulata Bouly de Lesd. 223
  f. radiata (Ach.) Nyl. 223, **224**
  f. rosulata (Ach.) Nyl. 223, **225**
  f. stellaris 223, **224**
  f. subradiata Nádv. 223
  f. subtenella Anders 224
  var. *adscendens* Th. Fr. 235
  var. papillosa Hillm. 223
  var. pergranulata Mereschk. 223
  var. *radiata* 224
  var. *rosulata* 225
  var. tuberculata (Kernst.) DT. et Sarnth. 223
tenella (Scop.) DC. sensu Bitt. (Physcia) 216, 217, 232, **238**
  f. anaptychioides Nádv. 241
  f. perisidiosa (Erichs.) Nádv. 241
  f. pseudisidiata Erichs. 241
  f. subbreviata Nyl. 241
  var. astroioides Nádv. 241
  var. revoluta Erichs. 241
tenellus Scop. (*Lichen*) 238
teretiuscula (Physcia) 243, 248
tribacia Ach. (*Lecanora*) 248
tribacia (Ach.) Nyl. (Physcia) 217, 242, **248**
tribacoides var. *caesiella* Bouly de Lesd. (*Physcia*) 242
ulothrix var. virella f. flavescens Cromb. (Physcia) 257
venusta Ach. (*Parmelia*) 265
violaria Erichs. (Physcia) 251
virella Flagey (*Physcia*) 253
  f. *Hueana* Lindau 256
  f. nigricascens Mereschk. 255
  f. tenuisecta Mereschk. 255
  var. gracilis Mereschk. 255
virellus Ach. (*Lichen*) 253
vitii Nádv. (Physcia) 247
wainioi Räs. (Physcia) 216, 242

NOTES ON MALAY COMPOSITAE III[1]

by

JOSEPHINE TH. KOSTER
(Rijksherbarium, Leiden)

(Issued 1. IX. 1952).

VERNONIEAE — VERNONINAE.

Among a small collection of *Compositae* collected in Sumbawa by R. Blomberg, 1941, a new *Vernonia* was detected. The description follows here.

Vernonia sumbavensis Koster, nov. spec. — sectio *Claotrachelus* (Zoll. et Mor.) Koster (*Fig. 1 a—e*) — *Herba*, 60 cm alta, e basi caules plures virgatos, subteretes, striatos, incane villoso-tomentosos, 2—4 mm crassos emittens; internodiis $^1/_2$—3 cm longis. *Radix* ramosa, crassa. *Folia* alterna, sessilia, numerosa, linearia vel lineario-lanceolata, margine parce revoluta, repande et breviter dentata vel subintegra, apice acuta, utrinque gradatim longe attenuata, pinninervia, nervo mediano et nervis lateralibus subtus prominentibus, supra obscura scabra, leviter incano-tomentosa vel subglabra, subtus incane tomentosa, chartacea, $3^1/_2$—$7^1/_2$ cm longa, 3—7 mm lata, superiora minora; saepe ramis brevissimis in axillis foliorum folia parva ferentes. *Inflorescentia* terminalis, corymbosa, 5—12 cm lata; *capitula* numerosa, pedunculata, campanulata, 25—35-flora, circa 1 cm longa, circa 8 mm crassa, pedunculis incane villoso-tomentosis, 2—10 mm longis, interdum apice vel ad basin bractea lineari minuta praedita; *involucrum* campanulatum, circa 8 mm longum, squamis 5—6-seriatis, externe gradatim brevioribus, dense incane pubescentibus, interioribus anguste oblongis, interdum purpurascentibus, apice breviter acicularibus, exterioribus squarrosis, lanceolatis, apice acicularibus; *receptaculum* nudum, alveolatum, glabrum, alveolis cupuliformibus; flores bisexuales, *corolla* infundibuliformis, 8—10 mm longis, lobis 5, oblongo-triangularibus, apice subacutis, parce hirsutis; *antherae* ad basin sagittatae, apice obtusae; *styli* rami longi, acuti, hirsuti; *achenium* turbinatum, 5—6-angulatum, dense glandulosum, circa $1^1/_2$ mm longum; *pappus* biseriatus, setaceus, setis albis, interioribus caducis, scabris, 5—8 mm longis, exterioribus brevissimis, applanatis.

LESSER SUNDA ISLANDS: Sumbawa, Mt. Tambora, 1900 m alt., IX 1941, *Blomberg s. n.* — *typus* (S).

New records of *Vernonia* species (cf. Blumea I, 1935, p. 435 and p. 448).

Vernonia moluccensis (Bl.) Miq.

SUMBA: near Waingapu, wayside, gardens, *Monod de Froideville 1357* (BO).

Vernonia vagans Wall. ex DC., a scandent shrub, sometimes 9 m high.

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[1] I — Blumea IV, 3, 1941, p. 482—492; II — Blumea VI, 1, 1948, p. 264—265.

BORNEO: Br. N. Borneo, Mt. Kinabalu: East of Lodge, 1500 m alt., II 1932, *Clemens 28183* (BM,) Tenompok, 1500 m alt., IV 1932, *Clemens s. n.* (BM), Penibukan, N.W. Hillside, jungle, 1200 m alt., III 1933, *Clemens 32223* (BM).

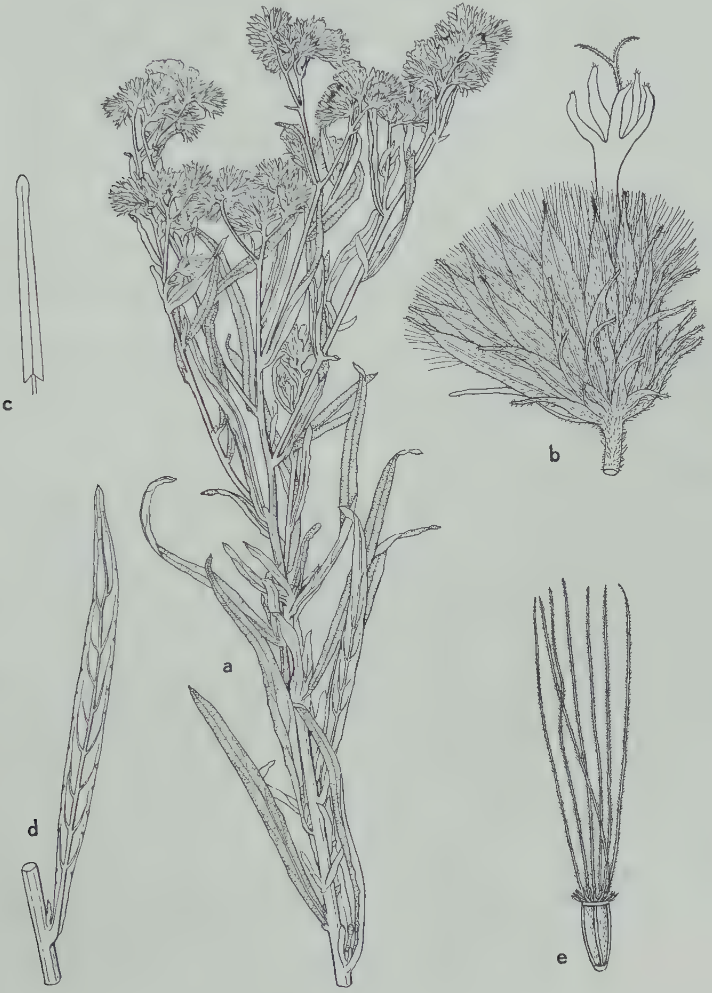

Fig. 1 — *Vernonia sumbavensis* Koster, nov. spec.: a — upper part of the plant, × $^{2}/_{3}$; b — involucrum and one flower, × 4; c — anthera, × $16^{1}/_{2}$; d — leave, × 1; e — achenium with pappus, × 6.

The type of *Conyza ivaefolia* Burm. Fl. ind., 1768, p. 180 appears to be a synonym of *Vernonia cinerea* (L.) Less.; it is preserved in the "Conservatoire botanique de la ville de Genève".

EUPATORIEAE — AGERATINAE.

Eupatorium odoratum L. originating from the warmer parts of America has escaped from cultivation in Sumatra, East Coast and Java, S.W. Preanger. It has odoriferous, pale violet flowers. The first records in Sumatra, East Coast, are from 1934 and 1935 (*van der Meer Mohr* s. n. L, BO). Clarke, Comp. Ind., 1876, p. 30, already mentioned the species being escaped in Java, but no conclusive material was seen by the present author in the herbaria examined (cf. Blumea I, 1935, p. 499). Since 1940 it has been found growing wild in West-Java, S.W. Preanger. It has been collected at 0—500 m alt., in and near estates, in second growth vegetation, locally abundant.

The specimens from the Malay Archipelago in the Rijksherbarium, Leiden, show a peculiar feature in the involucral scales, on which a new forma is based ¹).

Eupatorium odoratum L. Sp. Pl. ed. II, 1763, p. 1174; DC. Prodr. V, 1836, p. 143; Baker in Mart. Fl. Bras. VI, 2, 1873—1876, p. 287; B. L. Robinson in Proceed. Amer. Acad. Arts Sci. 54, 1918, p. 280; Koster in Pulle, Fl. Sur. IV, 1938, p. 113; Moore in Fawcett and Rendle, Fl. Jam. VII, 1936, p. 74.

f. **squarrosum** Koster, f. nova — Involucrum squarrosum, praecipue in alabastris, squamis acutis vel subacutis, apice reflexis.

JAVA: W. Java, Tjikopoh near Buitenzorg, *den Hoed 3166* — *typus* (L).
SUMATRA: East Coast, Medan, *van der Meer Mohr s. n.*, I 1935 (L).

ASTEREAE — CONYZINAE.

The genus *Conyza* L., as has been pointed out by Exell (Cat. Vasc. Pl. S. Thomé, 1944, p. 224) cannot be maintained, *Eschenbachia* being the correct name. Following this author, the species occurring in the Malay Archipelago have to be renamed in the following way.

Eschenbachia japonica (Thunb.) Koster, syn. *Conyza japonica* (Thunb.) Less., *Erigeron javanicum* Schultz-Bip.

Eschenbachia maxima (Zoll.) Koster, syn. *Conyza maxima* Zoll., *C. argutidens* Miq., *C. nitida* Koorders (non Schultz-Bip.).

Eschenbachia viscidula (Wall. ex DC.) Koster, syn. *Conyza viscidula* Wall. ex DC., *C. tamborensis* Boerl.

CICHORIEAE — CREPIDINAE.

A new combination is proposed.

Lactuca laevigata (Bl.) DC. var **pygmaea** (Zoll. et Mor.) Koster — syn. *Lactuca pygmaea* Zoll. et Mor. in Nat. en Geneesk. Arch. Néerl. Ind. II, 1845, p. 565; *Crepis nudicaulis* Schultz-Bip. (non L.) in Zoll. Verz. Ind. Arch., 1854, p. 125; *Aracium pygmaeum* Miq. Fl. Ind. Bat. II, 1856, p. 111; *Ixeris pygmaea* (Zoll. et Mor.) Stebbins in Journ. of Bot. 75, 1937, p. 50.

Emilia sonchifolia (L.) DC. — prob. syn. *Hieracium javanicum* Burm.

Hieracium javanicum Burm. (Fl. ind., 1768, p. 174 t. 57 fig. 1) has kept puzzled already during a long time those, who are studying Malaysian and Polynesian species of the genus *Emilia*. Probably no certainly will be obtained about the synonymy of this species, since the type has not been found in the "Conservatoire de la ville de Genève", where most of Burman's plants are preserved. This was stated by B. P. G. Hochreutiner

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¹) The same forma is known from: Malay Peninsula, Siam, Antilles and Surinam.

(in Candollea V, 1934, p. 338) and also the present Director gave the same information. Neither is it extant in the Rijksherbarium, Leiden.

F. R. Fosberg (Immigrant Plants in the Hawaiian Islands — Univ. Occ. Papers 46, 1948, p. 14—15) suggested that *Hieracium javanicum* Burm. might be the same species as the common *Emilia* in the Hawaiian Islands, a plant with brick-red, deep red or magenta-coloured flowers. In his opinion it is not *Emilia sonchifolia* (L.) DC., which also occurs in those Islands and has purple flowers. The difficulty aroused by a sentence in the text in Burman Fl. ind. p. 174, "Sonchus flore purpureo in Java inventus" was according to this author, caused by confusion in the original treatment. However, no wild growing *Emilia* plants with red flowers have been recorded from Java up to now, whereas *Emilia sonchifolia* (L.) DC. is very common there. The flowers of the last-mentioned species are described to be purple, pink or rarely white. It therefore seems more likely to put *Hieracium javanicum* Burman to the synonymy of *Emilia sonchifolia* (L.) DC..

The red-flowered *Emilia javanica* C. B. Robinson, as interpreted by F. R. Fosberg, does not occur in Java as far as known. Consequently it is unlikely that it was first described from Java, as was suggested by F. R. Fosberg (in Walker and R. Rodin — Additional Phanerogams in the Flora of Guam, Contrib. U. S. Nat. Herb. 30, 1949, p. 467).

J. Mattfeld (Die Compositen von Papuasien in Engler, Bot. Jahrb. 62, 1928, p. 445) distinguished *Emilia sonchifolia* (L.) DC. var. *javanica* (Burm.) Mattf. which was also based on *Hieracium javanicum* Burm. Fl. ind., 1768, p. 174 t. 57 fig. 1. This variety and *Emilia sonchifolia* (L.) DC. var. *sonchifolia* differ in the lower leaves, which are not figured in Burman's plate, nor are they fully described in the text. The only information there concerning the lower leaves can be found in this sentence: "In nostro specimine inferiora aeque ac superiora folia amplexicaulia, uti in figura depicta sunt." This is the case in var. *sonchifolia*, whereas in var. *javanica* Mattf. the lower leaves are sessile or attenuate towards the base. It is true, however, that we do not find any information about the lyrate shape of the lower leaves of var. *sonchifolia* in Burman's text and plate. It is hardly possible to distinguish var. *javanica* Mattf. in the Java material.

Willdenow (Spec. Pl. III, 1804, p. 1534) based *Prenanthes javanica* (Burm.) Willd. on *Hieracium javanicum* Burm. The same name was used by Blume (Bijdr., 1826, p. 887). In the Rijksherbarium, Leiden, no specimens named by Blume were found under that name.

Sprengel (Syst. Veg. III, 1826, p. 648) based *Sonchus javanicus* (Burm.) Spreng. on *Hieracium javanicum* Burm.. Junghuhn (in Nat. en Geneesk. Arch. Néerl. Ind. II, 1945, p. 43) mentions *Sonchus javanicus* Spreng., but he presumed that his species was not identical with the one of Sprengel. Indeed, Junghuhn's species was later on named *Sonchus malaianus* Miq. (Fl. Ind. Bat. II, 1856, p. 113), which species cannot be named *Sonchus javanicus* Jungh. (non Spr.), as was done by C. G. G. J. van Steenis (in Bull. Jard. Bot. Buitenzorg, Sér. III, Vol. XIII, 1934, p. 192), since the combination *Sonchus javanicus* had already been occupied by Sprengel in 1826.

HYMENOSPORUM IN NEW GUINEA (Pittosporaceae)

by

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(Flora Malesiana, Leiden)

(Issued 1. IX. 1952)

Hymenosporum flavum (Hook.) F. v. M. Fragm. 2 (1860) 77; Benth. Fl. Austr. 1 (1863) 114; Bailey, Queensl. Fl. part 1 (1899) 71; White & Francis, Proc. R. Soc. Queensl. 35 (1923) 63; Pritzel, in E. & P. Nat. Pfl. Fam. ed. 2, 18a (1930) 281; White, Contr. Arn. Arb. 4 (1933) 39. — *Pittosporum flavum* Hook. Bot. Mag. t. 4799 (1854).

TERRITORY OF PAPUA. Isuarava, *C. E. Carr 15625,* tree ca 6 m tall, in secondary forest, ca 1200 m alt., 18. 2. 36, flowers yellow; Boridi, *C. E. Carr 14869,* tree ca 6 m tall, in secondary forest, ca 1200 m alt., 11. 11. 35, flowers cream tipped yellow, petals suffused pale rose-lilac inside at base of blade.

Of the nine genera recognized in the *Pittosporaceae* eight were endemic in Australia, *Pittosporum* itself being widely distributed in the Old World flora. About 1900 the genus *Citriobatus* was recorded from Java (Icon. Bog. 1, 1901, 5, t. 77); it was later also found in Luzon and Celebes.

In this note it is shown that also the monotypic genus *Hymenosporum* is not entirely confined to the Australian continent. In Australia it occurs in rain forests from Queensland to New South Wales, specially appearing in cleared lands. The Papuan materials exactly match the Australian ones.

Its small size and pretty, scented flowers make it suitable for cultivation as an ornamental in the tropical hills. It was grown with success in the mountain garden at Tjibodas in West Java at ca 1400 m alt. (sub V. 142—142a). At Bogor, ca 250 m alt., it was also cultivated (sub no III. L. 3) but did not produce flowers.

A NEW FAMILY OF DICOTYLEDONS: DAVIDSONIACEAE

by

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(Leiden)

(Issued 1. IX. 1952)

In January 1949 Professor H. J. Lam, director of the Rijksherbarium, Leyden, on his way to the 7th Pacific Science Congress in New Zealand, spending some time in Fiji, was shown by Mr B. E. V. Parham, Department of Agriculture, Suva, Viti Levu, Fiji Islands, a slender tree, cultivated in the Agricultural Experimental Garden Naduruloulou. The tree was unidentified and of unknown origin. Some flowering material was collected and at our request Mr Parham was good enough to send some ripe fruits in liquid for an investigation I was entrusted with.

Additional material was studied from the herbaria at Brisbane, Kew, Leiden, Melbourne and Paris. It is my pleasant duty to tender my best thanks to the directors of these institutes for the loan of this valuable material, among which the type.

It appeared that the plant collected by Lam represents *Davidsonia pruriens* F. v. Muell., known from N.E. Australia only. On checking the literature it was found that the genus in question has some time been inserted in the *Saxifragaceae* and in the *Cunoniaceae*. Engler (in Engler-Prantl, Nat. Pfl. fam., 2nd ed., no 18a, 1930, 261—262) adds it to the latter family under the heading "Auszuschlieszende Gattung".

The reasons for this were that *Davidsonia* should differ from all *Cunoniaceae* by the not-opposite or not-whorled leaves, the exalbuminous seeds and some minor characters such as the non-exsert stamens and the stiff hairs.

Our material enabled us to reveal an additional differential character thusfar unknown, viz. the epitropous ovules. As far as we could check the ovules are always apotropous in *Cunoniaceae*.

On the other hand it differs from the *Saxifragaceae* likewise by the exalbuminous seeds as well as by the larger stipules, the few ovules and few (2) large seeds and minor characters such as the not-swollen placentae and the drupaceous fruits.

This is why it was thought that enough evidence is available to definitely take *Davidsonia* both from the *Cunoniaceae* and from the *Saxifragaceae* and raise it to the rank of a (monotypic) family.

Davidsoniaceae, nov. fam. — A Cunoniaceis foliis alternis, seminibus exalbuminosis, ovulis epitropis, staminibus haud exsertis, pilis rigidis, a Saxifragaceis seminibus exalbuminosis, ovulis et seminibus paucis (seminibus 2), fructubus drupaceis, stipulis magnis, placentis haud inflatis differt. — A single genus, *Davidsonia* F. v. Muell., thusfar with one species with two varieties in N.E. Australia.

Davidsonia F. v. Muell., Fragm. Phytogr. Austr. VI, 1867, 4, pl. 46 — Diagnosis like that of the single species.

Davidsonia pruriens F. v. Muell., l. c. — Baillon, Hist. d. Pl., 1872, III, 380 and 453 — Bailey, The Queensland Flora, 1900, II, 537—538 — Bailey, Compreh. Catal. Queensl. Pl., 1909, 169 — Engler-Prantl, Nat. Pfl. fam., 2nd ed., no 18a, 1930, 261—262. — Descriptio emendata et aucta.

Arbor gracilis, ad 10 m altus, cortice cinereo, ligno badio, capite satis laxo, pilos urenti-irritantes ferens. *Folia* alterna, impari-pinnata, stipulata, ad 1 m longa. Stipulae sessiles, subreniformes, palminerves, irregulariter acute dentato-serratae, ad 2 cm latae. Petiolus ad 6 dm longus, teres, alatus, alis acute dentato-serratis, partibus interjugalibus ad 1 dm longis. Foliola plerumque 13, sessilia sive brevissime petiolulata, praeter impar basi valde decurrens basi obtusa sive paululum decurrentia, inferiora magnitudine decrescentia, ovato-oblonga, superiora ad 4 dm longa, ovato-lanceolata, ad 1 dm lata, omnia coriacea, acuminata, irregulariter acute dentato-serrata, penninervia, reticulari-venosa, supra et subtus praecipue in nervis urenti-hirsuta simul cum petiolo, stipulis ramulisque. Costa media foliolorum subtus valde, supra vix prominens, nervi secundarii subtus prominentes, utrinque ad 20 angulo ± 60° de costa adscendentes, paulo curvati vel subrecti, margines versus haud distincte arcuatim conjuncti, nervi tertiarii subtus conspicui, inter secundarios plerumque transversi. *Inflorescentiae* aut paniculatae, panicula magna laxa, longe pedunculata, simul glomerato-spicatae spicis paucifloris, aut spicatae, spica densa mediocriter pedunculata, axibus foliorum superiorum, interdum paulo supra axillas insertae, dense urenti-hirsutae. Bracteae amplexicaules, bracteolae sessiles, utraeque ad 5 mm longae, ovatae, acuminatae, margine pilos capitatos ferentes. *Flos* incompletus, hermaphroditus, actinomorphus, hypogynus, aestivatione valvata. *Perigonium* crassum, gamophyllum, paululum ultra medium fissum, circiter 5 mm longum, rubellum, extus hirsutum, intus villosum, laciniis 5 deltoideis. *Discus* perangustus, ciliosus, subquinquangularis, 10 squamis nectariferis praeditus. *Stamina* 10, in disco inter squamas nectariferas inserta. Filamenta libera, glabra, 3 sive 5 mm longa, superne adunca, basi plus minusve tumida. Antherae oblongae sive ovales, thecis biloculatis, versatiles, longitudinaliter introrsum dehiscentes, filamenta longitudine aequantes sive multum breviores. *Granula pollinica*¹) 3-colporidata colpis tenuimarginatis, suboblata, circiter 9.7 × 12 μ. Extinus perspicue reticulatus, satis tenuis. Sexinum crassitudine nexinum aequare vel superare verisimile. *Pistillum* syncarpum, e duabus carpellis compositum. Styli 2, liberi, inferne hirsuti, superne glabri, curvati, circiter 5 mm longi. Ovarium

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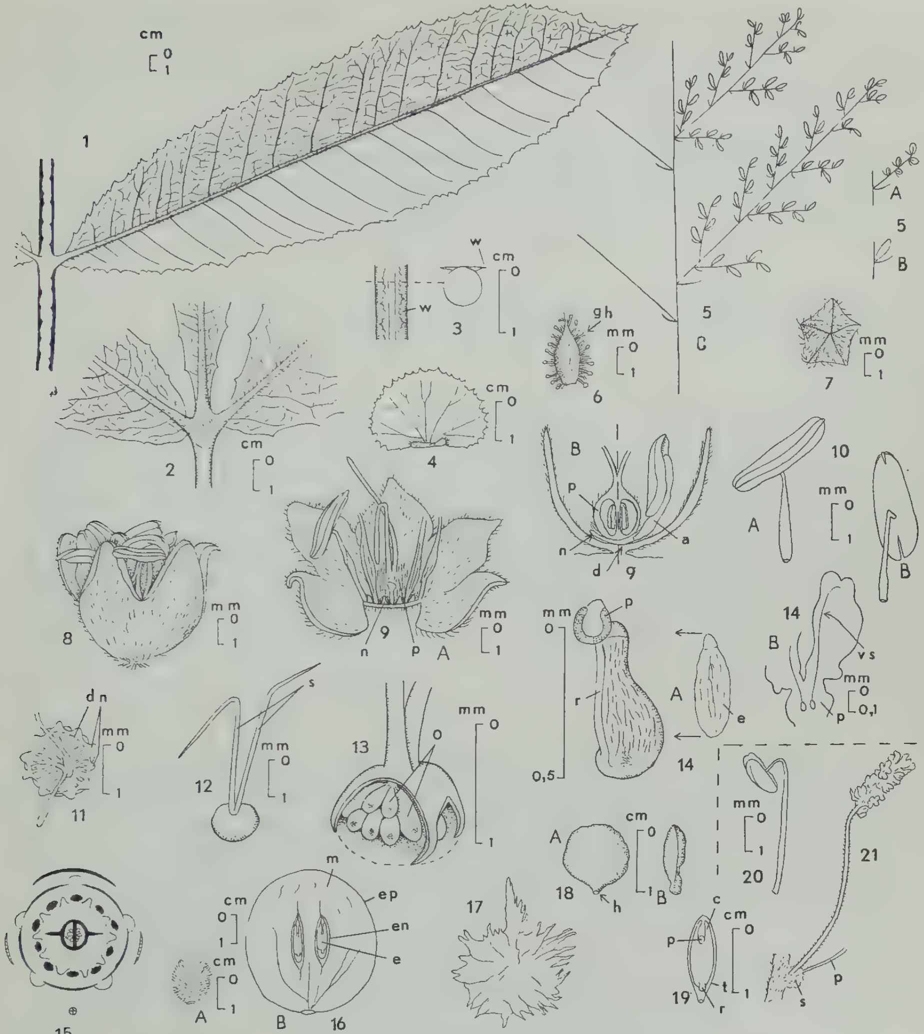
¹) I am indebted to Dr G. Erdtman, Bromma, Sweden, for providing these data.



Davidsonia pruriens F. v. Muell. — var. **pruriens** — 1. leaflet — 2. base of the three apical leaflets (lower side) — 3. petiole (w. wing) — 4. stipule — 5. diagram of inflorescence, A. spikelet, B. spikelet of A simplified (as in C) — 6. bract (gh. glandular hair) — 7. flowerbud — 8. flower — 9. flower, A. opened, B. longitudinal section (a. anther, p. pistil, n. nectary, d. disc) — 10. stamen, A. lateral view, B. dorsal view — 11. pistil from above (d. disc, n. nectaries) — 12. pistil stripped of hairs (s. styles) — 13. pistil opened (o. ovules) — 14A. and B. ovule (vs. vascular strand, p. placenta, r. raphe, e. young embryo from ovule) — 15. floral diagram — 16. fruit, A. young, B. mature in longitudinal section (m. mesocarp, ep. epicarp, en. endocarp, e. embryo) — 17. pyrene (endocarp) — 18. seed, A. frontal, B. lateral view (h. hilum) — 19. seed, longitudinal section (r. radicle, t. testa, p. plumule, c. cotyledons) — Figs 1—19 after *H. J. Lam no. 6921.* — var. **jerseyana** (F. v. Muell.) Bailey — 20. stamen — 21. inflorescence (p. petiole, s. stipule) — Figs. 20—21 after the specimen collected by *Bäuerlen* in Oct. 1892.

globoso-ovatum, circiter 2 mm diam., hispidum, biloculare septo completo, placentis axilibus orbiculatis. Ovula circiter 7 in utroque loculo, anatropa, epitropa, placentae margine inserta. *Fructus* verus, drupa dipyrena, juvenilis velutinus pilis rubellis, senior coerulescens, pruinosus, glaber, maturatus globoso-ovatus, ad 5 cm diam.. Epicarpium chartaceum, mesocarpium carnosum, endocarpium coriaceum. Loculi intus laevissimi. *Semina* in loculis solitaria, pendentia, orbiculari-ovata, compressa, exalbuminosa, ad 13 mm diam., basi breviter acuminata. Testa brunnea, laevis, glabra. Cotyledones embryonis plano-convexae, ovatae, rectae. Radicula brevissima, supera.

Var. **pruriens** (*fig. 1—19*) — Folia maiora. Inflorescentiae paniculato-spicatae. Antherae oblongae, filamenta 3 mm longa longitudine aequantes. Fructus circiter 5 cm diam.. — Distribution: Queensland, N.E. New South Wales.

Queensland — Murray's River, Rockingham Bay: *Dallachy* (MEL, *lecto-type*), fl. & fr. 12-8-1866; Ibidem: *Dallachy* (K, fragm. of type); Ibidem: *Dallachy* (MEL), fl. 10-11-1869; Rockingham Bay: *von Mueller* (L, P, presumably fragm. of type); Ibidem: *Lennard* (MEL); Daintree River: *Brass no. 2190* (BRI, P), fl. 28-2-1932; Ibidem: *Fitzalan* (MEL); Ibidem: *Pentzke* (MEL); Johnstone River: *Berthand (Bertheand)* (K); Glenallan, Malanda: *Hayes* (BRI). Cook District, Walsh River: *Barclay Millar* (BRI), fl. 5-1891; Mourilyan: *White* (BRI), fl. 2-1923; State Forest Reserve 185, Danbulla: *Doggrell* (BRI), fr. 28-9-1929; Johnstone River: *Michael* (BRI), buds 10-1915. Burnett District, Berner Creek, Innisfail: *Petrie* (BRI); Russell River: *Sayer* (MEL); Ibidem: *Coll.?* (MEL); Murray River: *Coll.?* (MEL), buds 14-4-1870.

New South Wales — Tweed River: *Fawcett* (MEL); Bot. Garden Sydney: *Boorman* (BRI), cult..

Fiji Islands — Viti Levu, Naduruloulou Agr. Exp. Garden: *Lam no. 6921* (L), cult., fl. 25-1-1949.

Var. **jerseyana** (F. v. Muell. ms) Bailey, Queensl. Fl., 1900, II, 538 — Folia minora. Inflorescentiae spicatae. Antherae ovales, filamentis 5 mm longis multum breviores. Fructus minus quam 5 cm diam.. — *Fig. 20—21* — Distribution: S.E. Queensland, N.E. New South Wales.

Remarks: There is no description of this variety by F. v. Muell.. Bailey (l. c.) remarks that the variety is smaller in all its parts than var. *pruriens*. As no type exists I propose to indicate as type the specimen collected by Bäuerlen at Richmond River, New South Wales, because it is probably the specimen F. v. Muell. and Bailey have seen, the more so as the specimen is a good one.

Queensland — Chillingham, Tweed River: *Dixon* (BRI), fl. 10-1933.

New South Wales — Brunswick River: *White* (MEL), fl. & fr. 11-1885; Richmond River: *Bäuerlen* (BRI), fl. 10-1892 (*lectotype* of var.).

Variety dubious:

Queensland — Endeavour River: *Persieh* (MEL); Johnstone River: *Berthand* (*Bertheand*) (MEL), 2 specimens; Ibidem: *Bancroft no. 154* (BRI).

New South Wales — Nimbin: *King* (BRI), fr. 2-3-1936; State ?, Gribble: *Bellurdia* (?) (MEL).

ITINERARY IN KENYA COLONY AND THE UNION OF SOUTH AFRICA

by

R. A. MAAS GEESTERANUS
(Rijksherbarium, Leiden)

In 1949 a trip was made to Kenya Colony, British East Africa, with the aim of collecting Phanerogamic plants and Ferns. The intention was to collect 12 sets of each number which I managed to do for about 70 %.

Except for the first set which will be incorporated in the Rijksherbarium, the plants will be sold to those institutes in Europe, S. Africa and America which had subscribed in advance. It is expected, however, that a few more sets in excess of the 12 aforementioned will be available. It should be noted that these will prove rather incomplete, numbering less than 30 % of the total amount.

In addition to the Phanerogams and Ferns mentioned above Lichens, Mosses, Fungi and a few Algae were collected, whereas occasionally I also paid attention to Insects and Molluscs.

After completion of the Kenya safari's, the Union of South Africa was visited where I collected Cryptogams and a few Insects and Molluscs. Of course, the latter groups will not be dealt with in this paper, but for technical reasons it is considered useful to enter them here. For the same reasons some specimens collected during the voyage from Europe to Mombasa, from Mombasa to Lourenço Marques, and from Cape Town back to Europe are inserted in this list.

Neither Insects nor Molluscs which have been inserted in the "Rijksmuseum van Natuurlijke Historie", Leiden, have received collector's numbers; they are entered in the list between brackets. At a rough estimate they amount to roundabout 3000 and 600 items respectively.

Finally, it may be added that the Cryptogams have only been numbered provisorily; more likely than not some numbers will have to be split into a, b, c, etc.

Locality	Date 1949	Group	Numbers
	Italy		
Genova	31 III—5 IV	(Mollusca)	
Rapallo, Arenzano	1 IV	(„)	
Nervi	4 „	(„)	
	Egypt		
Port Said	11 IV	(„)	

Locality	Date	Group	Numbers
British East Africa, Kenya Protectorate			
Mombasa	26 IV	Lichenes	4382—4385
Kenya Colony (Map I)			
Nairobi	27 IV—6 V	Lich., Fungi, Bryoph., Cyanophyc. (Insecta)	4371—4381, 4386—4505
Menengai	7 "	Phanerog.	4506—4523, 4526—4527
"	" "	Fungi (Insecta)	4524—4525
Rongai	8 "	Phanerog.	4528—4534
Menengai	" "	Phanerog.	4535
"	" "	Lich.	4536—4550
Menengai—Rongai	" "	Lich., Fungi	4551—4563
Menengai	9 "	Phanerog.	4564—4579
"	" "	Lich., Fungi	4605—4623
Lake Nakuru	10 "	Phanerog.	4580—4604
" "	" "	Lich., Bryoph. (Insecta)	4624—4644
Londiani	12—13 "	Phanerog., Filic.	4645—4665
Nairobi	16—18 "	Phanerog.	4666—4679
"	19 "	Lich.	4680—4686
Cherangani, locality 13	20 "	Phanerog., Filic.	4689—4693, 4696—4707
"	" "	Lich., Fungi, Bryoph.	4694—4695, 4708—4740
"	22—23 "	Phanerog., Filic.	4741—4796
"	" " "	Lich., Fungi, Bryoph. (Insecta)	4797—4856
Nairobi	30 "	Phanerog.	4857—4859
Londiani	7 VI	Phanerog.	4860, 4862
"	" "	Fungi	4861, 4863—4864
"	9 "	Lich., Bryoph.	4865—4898
"	10 "	Lich., Fungi	4910—4914
"	11 "	Phanerog. (Insecta)	4899—4909
Tinderet Forest Reserve, camp 1, 0° 5′ S. 35° 27′ E.	14 "	Phanerog., Filic.	4915—4932
"	" "	Lich., Fungi, Bryoph.	4933—4964
"	15—16 "	Phanerog., Filic.	4965—4984, 4988—5010
"	15 "	Lich.	4985—4987
"	17 "	Lich., Bryoph.	5011—5020, 5027—5030
"	" "	Phanerog., Filic. (Insecta, Mollusca)	5021—5026
Tinderet F. R., camp 2 0° 6′ 30″ S. 35° 29′ E.	19—20 "	Phanerog., Filic.	5031—5065
"	20 "	Lich., Fungi	5066—5095
"	21—22 "	Phanerog., Filic.	5096—5126, 5159—5174
"	22 "	Lich., Fungi, Bryoph. (Insecta, Mollusca)	5127—5158, 5175—5183
Tinderet F. R., camp 3 0° 4′ 45″ S. 35° 24′ 45″ E.	26 "	Phanerog., Filic. (Insecta, Mollusca)	5184—5204
Tindert F. R., camp 4 0° 6′ 10″ S. 35° 22′ 30″ E.	28—30 "	Phanerog., Filic.	5205—5287
"	29 "	Fungus	5309
"	1 VII	Lich., Fungi, Bryoph.	5288—5303, 5329—5342, 5346—5360

Locality	Date	Group	Numbers
0° 6′ 10″ S. 35° 22′ 30″ E....	1—2 VII	Phanerog., Filic.	5304—5308, 5310—5328
„	3 „	Phanerog., Filic.	5343—5344
„	„ „	Fungus (Insecta, Mollusca)	5345
Tinderet F. R., camp 5			
0° 1′ 15″ S. 35° 23′ 30″ E....	6—9 „	Phanerog., Filic.	5361—5453
„	6 „	Lich.	5570—5578
„	8 „	Fungi (Insecta, Mollusca)	5454—5463
Tinderet F. R., camp 6			
0° 0′ 30″ N. 35° 31′30″ E....	12—15 „	Phanerog., Filic.	5464—5509, 5514—5527
„	12 „	Lich., Fungi, Bryoph.	5536—5545
Timboroa-Equator	13 „	Lich.	5528—5529
Tinderet F. R., camp 6	15 „	Lich., Bryoph., Algae	5510—5513, 5530—5535, 5548—5567
„	„ „	Phanerog., Filic. (Insecta, Mollusca)	5546—5547, 5568—5569
Eldoret	24 „	(Insecta)	
Eldoret-Timboroa, Burnt Forest	25 „	Phanerog.	5579
Timboroa-Equator	28 „	Lich.	5580—5600a
„ „	31 „	Fungus (Insecta)	5600b
South Western Mau Forest Reserve, camp 7			
0° 23′ 30″ S. 35° 19′ 45″ E.	7—10 VIII	Phanerog., Filic.	5601—5661, 5669—5688
„	9 „	Hepat.	5668
„	10 „	Lich., Fungi, Bryoph., Algae (Insecta)	5662—5667, 5689—5708
S.W. Mau F. R., camp 8			
0° 36′ 30″ S. 35° 18′ 20″ E.	12 „	Lich., Bryoph.	5709—5725
„	12—15 „	Phanerog., Filic.	5726—5790, 5796—5812
„	12—14 „	Lich., Fungi, Bryoph. (Insecta)	5791—5795, 5813—5830
Londiani	18 „	Phanerog., Filic.	5831—5840, 5854—5859
„	18—19 „	Lich., Bryoph. (Insecta)	5841—5853
Eastern Mau Forest Reserve, camp 9			
0° 22′ 30″ S. 35° 43′ E.	25 „	Lich., Bryoph.	5860—5879
„	25—28 „	Phanerog., Filic.	5880—5958
„	27—28 „	Fungi (Insecta)	5959—5964
E. Mau F. R., camp 10			
0° 28′ S. 35° 45′ E.	30 VIII—2 IX	Phanerog., Filic.	5965—6021, 6034—6057
„	31 VIII—2 IX	Lich., Fungi, Bryoph., Algae (Insecta)	6022—6033, 6058—6092
E. Mau F. R., camp 11			
0° 28′ 30″ S. 35° 58′ 30″ E.	4—8 IX	Phanerog., Filic.	6093—6203, 6205
„	8 „	Lich., Fungi	6204, 6206
„	9 „	Phanerog., Filic. (Insecta)	6207—6230
Kisumu	14 „	(Insecta, Mollusca)	
Kakamega Forest Station, locality 12			
0° 14′ N. 34° 51′ 45″ E.	16—18 „	Phanerog., Filic.	6231—6241, 6247—6292
„	16 „	Lich.	6242—6246

Locality	Date	Group	Numbers
0° 14′ N. 34° 51′ 45″ E.	18 IX	Fungi, Bryoph.	6293—6300
„	19 „	Phanerog., Filic. (Insecta, Mollusca)	6301—6312b
Cherangani, locality 13 0° 57′ 30″ N. 35° 17′ E.	21 „	Phanerog., Filic.	6313—6339
„	21 „	Lich.	6340—6341
„	22 „	Phanerog., Filic.	6342—6355
„	22 „	Bryoph.	6356
„	23 „	Phanerog., Filic. (Insecta)	6357—6384

Kenya Protectorate

Mombasa	7 X	Lich.	6385—6392
„ , Shelly Beach	8 „	Algae (Mollusca)	6951—6953
„ , Port Reitz	9 „	Lich., Algae (Insecta, Mollusca)	6393—6400

Portuguese East Africa

Moçambique	14 X	(Mollusca)	
Beira	16 „	(Mollusca)	
Lourenço Marques	18 „	(Insecta)	

Union of South Africa

Transvaal (Map II)

Pretoria, Waterkloof	20 X	Lich., Bryoph. (Insecta)	6401—6414
Pretoria, Baviaanspoort	23 „	Lich., Bryoph.	6415—6424
„ „	„ „	(Insecta)	
Lijdenburg-Sabie, Mt Anderson	27 „	Lich., Fungi, Hymenophyll.	6425—6440
„	„ „	Bryoph.	6466—6467
„	„ „	Lich.	6441—6460
„	„ „	(Insecta)	
Sabie	„ „	Lich.	6461—6465
„	„ „	Algae	6478, 6490
Sabie-Nelspruit	„ „	(Insecta)	
Pretoria-Johannesburg, Leeukop	29 „	Lich.	6468—6477
Rustenburg, Retiefskloof	7 XI	Lich.	6479—6498
„ „	„ „	(Insecta)	
Johannesburg		(Insecta)	

Orange Free State (Map II)

Bloemfontein	16 XI	Lich.	6500—6514
„		(Insecta)	
5 miles west of Ladybrand	18 „	Lich.	6515—6534
Ladybrand	„ „	Lich.	6535—6549
„	„ „	(Insecta)	

Cape Province (Map III)

Cape Flats, Zeekoevlei	23 XI	Lich.	6550—6564
„ „		(Insecta, Mollusca)	
Villiersdorp-Franschhoek, Franschhoekpas	27 „	Lich., Alga	6565—6584
„	„ „	Phanerog.	6734
„	„ „	(Insecta)	
Cape Peninsula, Houtbaai,			

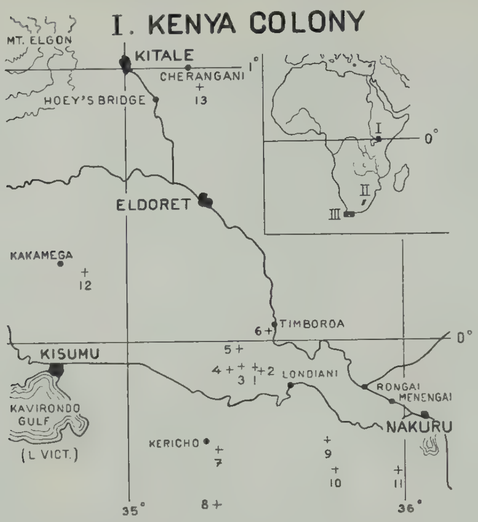
Locality	Date	Group	Numbers
Lower Chapman's Peak	25 XI	Lich.	6585—6604
Mosselbaai-George, Brakrivier	1 XII	Alga	6605
George-Wilderness	,, ,,	Lich.	6606—6610
Knysna, Garden of Eden	2 ,,	Lich.	6611—6623
Tzitzikama Mts., Storm Riv., Plaatbos	3 ,,	Lich., Bryoph.	6624—6647
,,	,, ,,	Fungus	6737
,,	,, ,,	(Insecta)	
,, , Eland Forest, Lottering	,, ,,	Fungi	6648—6649
Knysna, Garden of Eden	4 ,,	Fungus	6735
,, ,,	,, ,,	(Insecta)	
Storm Rivier-Knysna, Blauwkrantzpas	,, ,,	Lich.	6650—6652
Storm Rivier-Knysna, Groot Rivier	,, ,,	Lich., Alga	6653—6664
Plettenbergbaai	,, ,,	(Insecta)	
,, Robberg (Cape Seal)	,, ,,	Lich.	6665—6672
Knysna, The Heads	,, ,,	Lich.	6673
,, , Deepwalls Forest Res.	5 ,,	Lich., Bryoph.	6674—6699
Calitzdorp-Kruisrivier	6 ,,	Lich.	6700—6714
Montagu, Baden farm	7 ,,	Lich.	6715—6729
Montagu, Cogmanskloof	,, ,,	Lich.	6730—6731
Somerset West-Caledon, Elgin	8 ,,	(Insecta)	
Cape Flats, Zeekoevlei	12 ,,	Phanerog.	6732
,, ,,	,, ,,	Fungus	6733
False Bay, Steenbras River Mouth	10 ,,	Lich.	6737—6756
Cape Town, Devil's Peak	14 ,,	Lich., Fungi, Bryoph.	6757—6774
,, ,,	,, ,,	(Insecta)	
Cape Flats, Claremont	15 ,,	Lich.	6775
,, , Newlands		(Insecta)	
IJzerfontein	17 ,,	Lich.	6786—6790
,,	,, ,,	(Mollusca)	
Cape Peninsula, Houtbaai	18 ,,	Lich.	6791—6805
Wijnberg Flats	19 ,,	Lich.	6806—6810
Cape Town, Table Mt., Plat Klip	20 ,,	Lich., Sphagn.	6811—6825
Cape Flats, Strandfontein	,, ,,	Lich., Alga	6948, 6830
,, ,,	,, ,,	(Mollusca)	
,, Mowbray		(Insecta)	
Rondebosch, Groote Schuur		(Insecta)	
Kirstenbosch, Nat. Bot. Gard.	22 ,,	Fungi	6949—6950

South West Africa

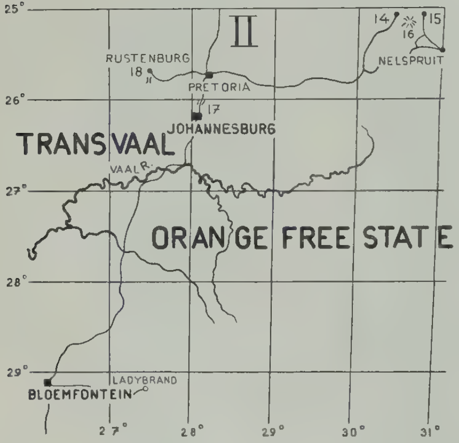
Walvisbaai	25—31 XII	Alga	6831
,,	,, ,, ,,	(Insecta, Mollusca)	
Swakopmund	28 ,,	Algae	6828—6829
,,	,, ,,	(Mollusca)	

Tenerife

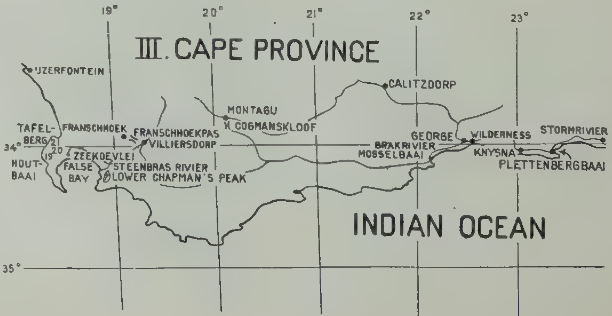
Laguna	9 I 1950	Lich.	6954—6956



1—6	Collections	made	in	Tinderet Forest Reserve
7—8	—	—	—	South Western Mau Forest Reserve
9—11	—	—	—	Eastern Mau Forest Reserve
12	—	—	—	Kakamega Forest Reserve
13	—	—	—	Cherangani Foothills & Mts.



14	Lijdenburg
15	Sabie
16	Mt. Anderson
17	Leeukop
18	Retiefskloof



19	Platklip
20	Kirstenbosch
21	Devil's Peak

OBITUARY

Dr A. W. KLOOS (1880—1952).

At the end of the previous number of "Blumea" could just be inserted the death notice of one of the honorary collaborators of the Rijksherbarium, Dr Ir A. W. Kloos, who passed away in his home at Dordrecht on June 3rd, 1952. A more detailed obituary may follow here.

Abraham Willem Kloos was born at Wormerveer on April 10th, 1880. At West-Knollendam he attended his father's school, afterwards went to the secondary school at Zaandam, and, in 1903, he took his degree as a civil engineer at Delft. Then, from 1904 till 1905 he worked as a teacher to the Nautical School, Schiermonnikoog, and from 1905 till 1911 he taught at the Secondary School, Goes. In the latter year Kloos was appointed to the Technical School, Dordrecht, where he worked until his retirement in 1945.

Though Kloos was not a professional botanist, he felt much attracted to taxonomy, and in his younger years already his development as one of the leading students of the Netherlands flora began. In his native town, Wormerveer, with its many flour-mills etc. he got an early opportunity of studying the adventive flora, and great was his pleasure in taking to school especially those rare species unknown to his teacher. "You'll always bring along such rare things as nobody has ever seen", the latter would exclaim. And that was just a thing young Kloos liked.

This early acquaintance with various aliens, no doubt, has been of great significance for Kloos' botanical development. The adventitious flora of his native country kept him interested during his whole life, and on account of his profound knowledge of it, he was an oracle for many. But besides his interest in the original Netherlands flora was keen, which his papers on various genera may show, e.g. *Veronica, Euphrasia, Viola, Thymus, Utricularia, Alchemilla, Potamogeton,* published in "Nederlandsch Kruidkundig Archief". During many years Kloos wrote his "Aanwinsten van de Nederlandse Flora" (Acquisitions to the flora of the Netherlands) for the same periodical, at first alone, afterwards with a number of co-operators. In "De Levende Natuur" may be found his annual lists of new and rare species of our flora. Several revisions of families for "Flora Neerlandica", by his hand are still unpublished.

Moreover Kloos played an important part in various functions to the Royal Netherlands Botanical Society, i.a. he was for many years the chairman of the floristic section and guided personally almost all botanical excursions. All this resulted in his appointment as an honorary member of this society in 1945. His botanical studies induced the Leiden University to grant him the degree of *doctor honoris causa*, together with his friends and fellow-botanists Jansen and Wachter.

Kloos has gathered a large herbarium, a collection giving a splendid idea of the Netherlands adventitious flora, and comprising a great part of the aliens found in this country. This collection will be transferred to the Rijksherbarium, to be inserted there in the Netherlands section. Very interesting was also his garden at Dordrecht, containing many rare and curious plants, collected during his frequent botanical trips.

During the last few years Kloos has been an honorary member to the staff of the Rijksherbarium. In this function he worked on the preparation of a monograph of *Amaranthus*, for which he had already studied many materials from a great number of herbaria. Unfortunately he has not succeeded in accomplishing this work. A serious operation caused him to suspend his work for many months, and when he seemed capable of resuming his activities, death put an end to his laborious life.

Kloos with his wide knowledge of the Netherlands flora, passed away, deplored by many, not the least by his botanical friends, who have known and esteemed him as the calm, critical man of science, always ready to assist.

S. J. VAN OOSTSTROOM.

REVIEW.

G. ERDTMAN, Pollen Morphology and Plant Taxonomy — Angiosperms (An introduction to Palynology. I) — Stockholm (Almqvist & Wiksell) and Waltham (Chron. Bot.) 1952. Printed in Sweden. XII + 539 pp., coloured title plate and more than 1000 figures in 261 illustrations. Price Sw. cr. 73.—.

For more than thirty years the well-known Swedish palynologist Dr G. Erdtman has consistently gathered facts about pollen types. Pollen-analysis led him, naturally, and necessarily, to pollen morphology, so as to lay a safe basis for further palaeobotanical work.

It will be a surprise to many a reader of the above book that the term "palynology", already very familiar among botanists, was only coined in 1944. This term, mostly but apparently erroneously applied in a palaeobotanical sense only, just means "pollen science" and is therefore more or less synonymous to pollen (external) morphology s. l.

The book, announced here, adorned with a foreword (in French) by Prof. H. Humbert, of Paris, and dedicated to three well-known botanists (I. W. Bailey, C. Skottsberg and R. P. Wodehouse), who in some way or other are connected with the author or his work, comprises the results of his many and painstaking investigations in a much condensed but very efficient form. It is a worthy successor of Wodehouse's pioneer book of 1935. In some respects, notably in a descriptive, morphological and taxonomic sense, it is much more complete than the latter; on the other hand it purposely omits other facts, either since these have been circumstantially discussed by Wodehouse or because they will be treated, as far as fitting in the critical context of Erdtman's book, in a second volume which will deal with the Lower Cormophyta and literature on pollen statistics and palynology.

The bulk of the work consists of an alphabetical list of 327 families. This list is preceded by short but quite indispensable introductory chapters in which first of all the contacts of palynology and its possible use for other disciplines is pointed out. Other paragraphs are dealing with the way in which pollen preparations are to be made. Since Wodehouse's work great progress has been made, both in this field and in the description and terminology of details. As to the latter Erdtman has introduced a whole system of terms, many of which are newly coined. I would not venture to say that this system (and some similar systematizations) almost seem too perfect and formalistic, for every one item is probably essential and indispensable; but I could not help being sometimes reminded of another valuable work of Swedish thoroughness, in which the terminology is so much elaborate that its practical usability seems somewhat doubtful (G. E. Du Rietz, Life Forms of terrestrial Flowering Plants I, 1931; as far as I know discontinued). It is fortunate that, beside the illustrated introductory paragraph on terminology, there is, at the end of the work, an extensive glossary, comprising more than 200 entries (in 14 pages) for most of which reference is made to elucidating figures in the next. Wodehouse's glossary only explained some 60 terms.

However this may be, Erdtman's terminology, though rather complicated, is exceedingly clear and logical and is obviously the outcome of a very meticulous scrutiny, the result being an admirably trustworthy basis for future research.

Taxonomical specialists will probably disagree with the delimitation of certain families, with which they are thoroughly familiar; a delimitation which is, admittedly, not always in accordance with current, still less with recently expressed views. It should, however, be realized that the author is not a taxonomical specialist and the main point is, that all major groups have been dealt with — though to a rather variable extent — and that after all, every taxonomist will be able to find what he is looking for, either in the index (down to genera) or in the very extensive if yet incomplete bibliography (42 pp.!), to which the short indications in the text repeatedly refer.

Being fully aware of the fact that he is not a taxonomist by profession, Erdtman has carefully refrained from expressing opinions on taxonomical relationships; but he provides us with all data which may be of use as auxiliary evidence, showing in which direction the "palynological compass-needle" points and in which it clearly does not. Though gross taxonomy of the old (macromorphological) style, has proved to be fairly self-sufficient, it has, regarding details, greatly profited in recent decennia by the results of cytogenetics and anatomy. Like the latter, palynology may give additional help but it has likewise to be applied critically and carefully, for in some cases its results seem irrelevant, though in others it is able to provide us with evidence of a clearly elucidating or corroborating nature.

The illustrations are all original, very clear and of standard enlargement but the user of the book will, of course, have to make himself fully familiar with the technique of making preparations and with the terminology, if he is to get full profit out of the book for his own purposes.

While we are looking forward to Vol. II, we may congratulate both Dr Erdtman, the editors and botanical science on the publication of this work, whose usefulness to palaeobotanists, above all, is evident. Erdtman's unique creation, the Palynological Laboratory at Bromma, Sweden, will, at an increasing degree, be an indispensable source of information for taxonomists, for many data had to be left unpublished; on the other hand, this Laboratory may rely on the co-operation of numerous taxonomists, "refunding" — to quote an Erdtmanian complimentary phrase in the reverse sense — "in taxonomical currency, our debts to this outstanding palynologist".

H. J LAM.

ERRATA (Blumea VII, 1, p. 146).

Line 8: replace: DECIDUAE by PLICATAE; omit: Arbores vel frutices decidui.

Line 10: replace: SEMPERVIRENTES by PLANAE; omit: Arbores vel frutices sempervirentes.